Draft Environmental Impact Statement
Executive Summary and Socio-Economic Excerpts of the DEIS

Spaulding Turnpike Improvements NHS-027-1(37), 11238

Newington to Dover, New Hampshire

Prepared for: **New Hampshire Department of Transportation and Federal Highway Administration**

Prepared by: ***VHB*/Vanasse Hangen Brustlin, Inc.**
Bedford, New Hampshire

July 2006

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NEWINGTON-DOVER
SPAULDING TURNPIKE IMPROVEMENTS
STRAFFORD AND ROCKINGHAM COUNTIES, NEW HAMPSHIRE

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Submittal Pursuant to 42 USC 4332 (2)(c) and
49 USC 303, 16 USC 470 (f), 33 USC 1344
by the
US Department of Transportation
Federal Highway Administration
And
New Hampshire Department of Transportation

Cooperating Agencies

US Army Corps of Engineers
US Environmental Protection Agency
US Coast Guard
US Fish and Wildlife Service
National Marine Fisheries Service

Federal Aviation Administration
NH Division of Historical Resources
NH Department of Environmental Services
NH Fish and Game Department
NH Office of Energy and Planning

July 19, 2006
Date of Approval

James A. Moore
For NH Department of Transportation

July 19, 2006
Date of Approval

For Federal Highway Administration

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The proposed project involves reconstruction and widening of a 3.5-mile section of an existing highway facility (Spaulding Turnpike/NH 16, extending north from the Gosling Road/Pease Boulevard Interchange (Exit 1) in the Town of Newington, across the Little Bay Bridges, to a point just south of the existing toll facility in the City of Dover) that serves as a major north-south transportation link for the State of New Hampshire. The proposed action would improve safety and increase transportation efficiency by relieving traffic congestion and reducing travel time, and accommodate projected increases in traffic demand. Alternatives considered in this EIS include (1) taking no action; (2) upgrading the existing route to add capacity; (3) applying Travel Demand Management (TDM) measures, such as transit system expansion, additional park-and-ride lots, high occupancy vehicle lanes, *etc.*; (4) applying Transportation System Management (TSM) improvements to selected interchange locations and existing roads; and (5) combinations of these alternatives. Various options for bridge rehabilitation, widening, and/or replacement of the Little Bay Bridges, final disposition of the historic General Sullivan Bridge, consolidation of the interchanges, and various designs of grade, alignment, and geometry were evaluated. Impacts to the natural, cultural, and socio-economic environment were analyzed, including the indirect and cumulative impacts associated with the project. Mitigation is proposed to offset or reduce unavoidable direct impacts associated with the project.

Agencies listed above have been invited to be Cooperating Agencies for the EIS process and representatives have participated in appropriate project coordination meetings.

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Executive Summary

A. Project Description/Purpose and Need

A.1 Study Area Description

The section of Spaulding Turnpike (NH 16) under study is approximately 3.5 miles long, extending from just north of Exit 1 in Newington to just south of the Dover Toll Plaza, including the Little Bay Bridges. Most of this section of the Turnpike is a limited access (fully controlled) facility and consists of two (2) through lanes in each direction separated by a median of varying width. The study area includes five interchange areas (Exits 2, 3, 4, 5 and 6) to accommodate access and turning movements in a relatively short section of the Turnpike. The Turnpike is part of the National Highway System and is functionally classified as a principal arterial connecting the Seacoast Region with Concord, the Lakes Region and the White Mountains.

Poor traffic flow conditions can be attributed to two separate factors: physical infrastructure deficiencies and high traffic volumes. Physical deficiencies along the Turnpike include substandard curvature along interchange ramps, inadequate acceleration and deceleration lanes at interchanges, inadequate weave distances between the interchange ramps, and substandard shoulder widths on the Little Bay Bridges. These factors, combined with high traffic volumes, often result in reduced travel speeds, constrained maneuverability, and congestion during the peak hour conditions, as well as the increased potential for crashes and its negative effect on safety.

Crash data supports the diminishing level of safety along this section of the Turnpike. Over a seven-year period, from January 1997 through December 2003, a total of 1,263 crashes were recorded in the study area, with an overall crash growth rate of 14 percent per year. This yearly growth rate is approximately six times higher than the rate of traffic growth (2.3 percent) along the Turnpike during the same time period and a strong indicator of the deteriorating level of safety.

In addition to the physical deficiencies of the Spaulding Turnpike, the traffic volume demands on the corridor also contribute toward the poor traffic flow. During the commuter weekday peak hours (7:00-8:00 AM, 5:00-6:00 PM), study area motorists traveling along the Spaulding Turnpike currently experience

traffic congestion and substantial delay. With the Little Bay Bridges currently carrying in excess of 70,000 vehicles per day, many of the freeway segments and interchanges along the highway experience volume demands that exceed the available capacity of the roadway system. Traffic forecasts for the year 2025 project traffic to increase from its current level to approximately 94,600 vehicles per day.

A.2 Purpose and Need

The project Purpose and Need statement is fundamental to the analysis of the project under the National Environmental Policy Act (NEPA), the Clean Water Act (Section 404), and other environmental regulations. The following Purpose and Need was developed in conjunction with a public Advisory Task Force (ATF), reviewed by other State and Federal agencies with no objections, and unanimously adopted by the ATF on October 29, 2003.

Purpose

The purpose of this project is to improve transportation efficiency and reduce safety problems, while minimizing social, economic, and environmental impacts, for an approximate 3.5-mile section of the Spaulding Turnpike extending north from the Gosling Road/Pease Boulevard Interchange (Exit 1) in the Town of Newington, across the Little Bay Bridges, to a point just south of the existing Toll Plaza in the City of Dover. Options that include implementing Transportation System Management (TSM) improvements, reusing the General Sullivan Bridge for local motorized and non-motorized traffic, enhancing rail service, improving bus transit service and instituting other Transportation Demand Management (TDM) strategies that may reduce vehicle trips along the Spaulding Turnpike have been considered, in addition to widening the mainline, widening and/or replacing the Little Bay Bridges, and reconstructing the interchanges.

Need

The Spaulding Turnpike is eastern New Hampshire's major limited access north-south highway, serving as a gateway linking the Seacoast Region with Concord, the eastern portion of the Lakes Region, and the White Mountains. The Turnpike is also part of the National Highway System reflecting its significance as an important transportation link in the state and regional system. Functionally classified as a principal arterial, it is a major commuter route which ties the growing residential areas of Dover-Somersworth-Rochester with the industrial and regional commercial centers in Newington, Portsmouth, and northern Massachusetts. It serves as the major artery for freight into and out of the areas north of the Little Bay Bridges, and is the economic lifeline of the region. It also serves as a major tourist route, providing access to the northern reaches of the state from the seacoast and points south of New Hampshire.

Traffic volumes on the Little Bay Bridges have steadily increased from approximately 30,000 vehicles per day in 1980 to greater than 70,000 vehicles per day in 2003 resulting in high levels of congestion on the bridges and along the Turnpike near and within the interchange areas.

Over the next 20 years this average daily volume is expected to increase to approximately 94,600 (2025) vehicles per day. These projections support the conclusion that the existing facility will be increasingly less able to operate at the levels of service and safety for which it was originally designed. During weekday and weekend peak hours of the day, the Turnpike currently operates at unacceptable levels of service (LOS E and/or F) with motorists experiencing severe congestion and long delays within this segment of the corridor.

The Turnpike has a number of existing geometric deficiencies including substandard shoulder width on the Little Bay Bridges and substandard merge, diverge, and weave areas at the interchanges. Many of the traffic maneuvers required to enter, exit or change lanes along this section of the Turnpike are capacity-constrained under current traffic conditions and contribute to driver discomfort and crashes. Existing acceleration, deceleration and weaving sections along the Turnpike are inadequate by current design standards. Historic crash data indicates that the frequency of vehicle crashes continues to increase raising concerns relative to motorist safety. Due to the nature of the existing facilities, these crashes, as well as vehicle breakdowns, create long delays in an area for which there are no viable alternate routes.

In addition to the capacity deficiencies and safety issues, this section of the Turnpike bisects residential and recreational areas in Dover and the residential and commercial/industrial areas in Newington resulting in an inefficient and circuitous use of the Turnpike by people desiring to travel east-west and vice versa. Local connectivity for motorists, pedestrians, and bicyclists from one side of the Turnpike to the other is also deficient.

This section of the Turnpike is located in a moderate seismic region, identified as Seismic Performance Category B. The Little Bay Bridges and General Sullivan Bridge, which are classified as major structures, were not designed to meet the current seismic design criteria for this region.

The project is included in the State's Ten-Year Transportation Improvement Program and is the top long-term transportation priority of the Seacoast Metropolitan Planning Organization (MPO). As residential and commercial development and traffic growth along the corridor and within the region continue to increase, traffic operations and safety conditions will deteriorate further, resulting in increased vehicle delays, increased crash frequency, and the potential loss of commerce.

B. Description of Preferred Alternative

Based on the evaluation of the reasonable range of project alternatives, and on public comments, input from resource agencies, the Advisory Task Force, Rockingham Regional Planning Commission, and Strafford Regional Planning Commission, and considering safety, transportation efficiency, cost, impacts to the environment, impacts to private property, permitting issues, and community support, the following combination of transportation elements has been determined to represent the Preferred Alternative. It best balances the impacts and issues in addressing the project's Purpose and Need:

- Rehabilitate/Widen the Little Bay Bridges (LBB) to eight lanes (three general purpose lanes plus an auxiliary lane in each direction) maintaining the existing easterly edge of the bridge and widening entirely to the west.
  - Eight lanes on the bridges would provide an adequate level of service (LOS D) for the projected travel demand in 2025 and would offer satisfactory levels of service for an additional 10 to 12 years beyond the design year (based on extrapolating the projected traffic growth).
  - The three general purpose lanes plus an auxiliary lane in each direction (*i.e.,* eight lanes in total) on the Turnpike would extend between Exits 3 and 6. Six lanes in total would extend south of Exit 3 to match into the exiting cross-section of the Turnpike at Exit 1 and would extend through Exit 6 to the Dover toll plaza.
  - The existing profile of the Little Bay Bridges (suitable for 60 mph design criteria) would be maintained, as would the existing vertical clearance over the channel.
  - The bridge rehabilitation would involve replacing the existing bridge decks, modifying the steel girders to upgrade the pin and hanger connections, repainting the steel girders, and seismically retrofitting the existing pier columns.
  - Bridge construction would be completed in two phases with traffic maintained on the existing bridges while the proposed bridge widening is constructed and traffic shifted onto the widened section of the bridge while the existing bridges are rehabilitated.
  - Widening westerly (towards the General Sullivan Bridge) would minimize the impacts to Little Bay and Hilton Park.
  - Cost of the Little Bay Bridge Rehabilitation and widening is estimated to be approximately $55.5 million.
- Rehabilitate the General Sullivan Bridge (GSB) to a six-ton loading capacity to continue to function as a pedestrian/bicycle/recreational facility and to

accommodate emergency response and maintenance vehicles from Newington

- The GSB is a historic landmark structure. It is the second highest rated historic bridge in the state, eligible for the National Register of Historic Places, and identified as a highly valued Section 4(f) resource.
- The GSB is currently an important bike/pedestrian connection across Little Bay and is used for fishing and other recreational activity. These transportation connections and recreational activities will be more pleasurable on the GSB in comparison to the use of a multi-use path attached to the widened Little Bay Bridges, which will carry a large volume of vehicles at highway speed.
- Retaining the GSB as part of the Preferred Alternative requires the removal of the GSB's northerly approach embankment and wingwalls to facilitate the proposed reconstruction of a local access connector under the LBB. The existing concrete wingwall along the approach embankment would be removed essentially exposing the back of the GSB abutment. With the removal of the northerly approach embankment, a new 280-foot long pedestrian/bike path including a 155-foot pedestrian/bicycle structure is proposed that would connect the northerly end of the GSB with the local access road sidewalk and with Hilton Park.
- The estimated cost to rehabilitate the GSB to a six-ton capacity is approximately $23.0 million. The rehabilitation would involve the complete replacement of the deck and supporting structural system (*i.e.* floor beams and stringers), other miscellaneous repairs to the structural steel to arrest future corrosion, cleaning and painting the entire structure, and repairing the substructure (patching spalls and repointing the masonry). A seismic retrofit to primarily prevent the potential collapse of the structure will include at a minimum, a bearing retrofit. The net additional cost to the project of rehabilitating the GSB is estimated to be approximately $9.7 million, or approximately 5 percent of total project costs taking into account $5.0 million for the structure's removal and $8.3 million to replace the recreational connection across the Bay with a 16-foot wide multi-use path attached to the Little Bay Bridges. This does not take into account the cost of the necessary mitigation should the GSB be removed, which would further reduce the net cost difference.

- Alternative 3 in Dover
  - This Alternative provides a full service interchange at Exit 6 and improves both system and local connectivity for the neighborhoods on both sides of the Turnpike and US 4, and for travelers heading easterly on US 4 towards Dover and northerly on the Turnpike.

- The proximity of the signalized diamond-type interchange at Exit 6 necessitates the closing of the Cote Drive on-ramp to the Turnpike.
- A two-lane northbound off-ramp widening to provide dual left and right turn lanes at its intersection with US 4 is proposed to handle the heavy volume of traffic exiting the northbound Turnpike at Exit 6.
- A new two-way bridge (replacing the existing westbound only bridge) would be constructed to carry US 4 over the Turnpike.
- Signals would be installed at the northbound ramps and at the southbound on-ramp. A third signal could potentially be required at the Dover Point Road intersection to provide safe egress for the neighborhood.
- A bridge would be constructed to carry US 4 over a new local connector roadway between Spur Road and Boston Harbor Road. This grade-separated facility provides a local connection for the neighborhoods north and south of US 4 and eliminates the need for a traffic signal at the Boston Harbor Road/ US 4 intersection, where turns would be restricted to right turns in and out only. A short on-ramp from this local connector to the southbound on-ramp from US 4 would maintain convenient access from the Dover Point neighborhoods and Hilton Park, while reducing some of the traffic demand at the Boston Harbor Road/ US 4 intersection.
- The Exit 5 off and on-ramps would be discontinued. The proximity of these ramps to the reconfigured Exit 6 would create traffic operational and safety problems. In addition, upgrading the geometry of the Exit 5 interchange to current standards would impact Hilton Park. Access to the park and Wentworth Terrace will be provided *via* a new two-way local connector road traversing under the Little Bay Bridges adjacent to the channel.
- An underpass utilizing the existing traveled way beneath the Little Bay Bridges is proposed to connect the east and west sides of Hilton Park and the residential neighborhoods. The existing roadway would be widened to accommodate two-way travel at a design speed of 20 mph. This underpass location provides the benefit of utilizing an existing grade-separated crossing as opposed to locating a grade-separated crossing further north, which would necessitate elevating the Turnpike and increasing noise and aesthetic concerns for the surrounding properties. The existing east-west pedestrian and bicycle connection at this location will be maintained.
- Sound barriers are proposed on both the east and west sides of the Turnpike between the LBB and Exit 6 which will mitigate for the elevated noise levels. Sound barriers are also proposed on both the east and west sides of the Turnpike north of Exit 6.

- The construction cost of Alternative 3 is estimated to be approximately $39.5 million.

- Alternative 13 in Newington
  - This alternative provides a reconfigured full service interchange at Exit 3 (Woodbury Avenue), a northern access into the Tradeport, and maintains on and off-ramps to provide full access at Nimble Hill Road and Shattuck Way at Exit 4.
  - This alternative also eliminates the ramps at Exit 2 (rerouting traffic to Exit 3), and includes provisions for a future Railroad Spur over the Turnpike into the Pease Tradeport should the need arise. Right-of-way and easements will be procured as part of the project and a portion of the railroad bridge's pier foundation will be constructed within the median of the Turnpike. An agreement between the NHDOT and the Pease Development Authority (PDA) with concurrence from FHWA will also be secured as part of the project to outline a shared cost arrangement should the rail spur be constructed in the future.
  - The ExxonMobil gas station/convenience store will continue to operate at its current location. However, access to the station from the Nimble Hill Road ramps will be precluded. A local roadway, which would provide access to the gas station, Thermo Electron, and one other parcel (with existing direct access to the Turnpike) is proposed. This local roadway could also provide access to the former drive-in property *via* the roadbed of the existing southbound Turnpike (once discontinued) should that property be developed in the future.
  - Woodbury Avenue would be reconstructed to extend the two existing lanes in each direction with a center-raised median from the Fox Run Road intersection through the Exit 3 interchange area. A reduced cross-section is proposed in front of the Isaac Dow house and Beane Farm property to minimize impacts to these two historic resources.
  - In conjunction with the Interim Safety Improvement project, this alternative improves local connectivity by providing a direct connection (via Shattuck Way) between the east and west sides of the Turnpike, and provides a local connection between Woodbury Avenue and the Tradeport.
  - Bridge work will include the construction of a 3-span structure to carry Woodbury Avenue over the Turnpike, and widening and rehabilitation of the structure carrying the Turnpike over Shattuck Way.
  - Two signals are proposed, one each at the intersection of the northbound and southbound Exit 3 ramps with Woodbury Avenue.
  - The construction cost of Alternative 13 is estimated to be approximately $39.8 million.

- Of the various Transportation System Management elements that were identified for the project:
  - Improving the deceleration condition and signing at northbound Exit 6W have been completed.
  - Improving the signing on the LBB to emphasize the "no lane change zone" on the bridge has been completed.
  - The Interim Safety Improvement Project at Exit 4 in Newington is under construction and scheduled to be completed in 2006. As part of the project, an auxiliary lane between Exits 3 and 4 northbound will be created to improve traffic merging from Woodbury Avenue onto the Turnpike.
  - One other TSM element that is recommended will provide short-term relief at Exit 6 by re-striping the Exit 6 southbound on-ramp area to create two through lanes on the Turnpike and a one-lane on-ramp from US 4. Temporary closure of the southbound on-ramp from Boston Harbor Road would be required. This would cost approximately $100,000.

- A number of Travel Demand Management actions are proposed to complement the bridge and roadway infrastructure improvements. Early implementation of these actions will also provide greater options to study area commuters during construction.
  - A new park-and-ride facility consisting of 416 spaces is proposed for the Exit 9 area in Dover. The facility is under design and will be constructed as a separate project under the federal Congestion Mitigation and Air Quality (CMAQ) program. Construction is scheduled for 2006 with completion in 2007 to coincide with the planned Cooperative Alliance for Seacoast Transportation (COAST) express bus service and Dover's downtown transit loop service.
  - A park-and-ride facility consisting of approximately 200 spaces is proposed for the Exit 13 area in Rochester. The NHDOT recommends that this project be addressed either under the CMAQ program or as part of the Rochester 10620H project (currently planned to advertise in 2008).
  - A park-and-ride facility consisting of approximately 30 to 50 spaces is recommended for the US 4/NH 125 intersection area in Lee to accommodate travelers using US 4 eastbound. The NHDOT also recommends advancement of this project under the CMAQ program.
  - To improve bus service in the seacoast area and reduce peak hour headways to provide a more attractive and reliable mass transit mode of travel, three bus alternatives will be advanced.

- Bus Alternative 1 involves expanded intercity service for Rochester, Dover, Portsmouth and Boston to serve the commuter market.
- Bus Alternative 2 involves expanding the 2006 planned COAST express bus service among Rochester, Dover, and Portsmouth to reduce headways during the peak period for the planned express commuter bus service.
- Bus Alternative 3 involves improving connectivity and headways for three existing bus routes: COAST Route 2 service between Rochester and Portsmouth, Wildcat Transit Route 4 service between Durham and Portsmouth, and COAST Tradeport Trolley services which connects these two routes with the Tradeport.

- Expansion of the *Downeaster* service is also proposed. A joint-sponsored CMAQ proposal (total cost $6.0 million) by the Maine DOT, NHDOT and Northern New England Passenger Rail Authority (NNEPRA) (Rail Alternative 1C) would fund track and siding improvements in Maine and New Hampshire which would allow NNEPRA to operate a fifth weekday roundtrip (current service is four roundtrips per weekday) between Portland and Boston. In addition, commuter peak period service would improve with the arrival of the weekday AM commuter train in Boston at 8:00 AM, as opposed to 9:00 AM which is the current schedule. The NHDOT is advancing this effort through a $1.7 million CMAQ application.
- To support the promotion of employer-based measures to encourage travel other than by SOV, it is recommended that funding for the seacoast area TMA, Seacoast Commuter Options, be provided to help extend the service for a period of five years. The TMA is aggressively promoting its ride-share and guaranteed-ride-home programs and meeting with seacoast employers to offer cost-effective commuting alternatives. This extension of funding could be accomplished through the CMAQ program or with project-related funds.

C. Project History

This section of the Turnpike evolved from a two-lane facility when the General Sullivan Bridge was constructed in 1935 to the current median divided four-lane highway with five interchanges in a very compact and constrained area. The first Little Bay Bridge (currently carrying southbound traffic) was constructed in 1966 with the second bridge carrying northbound traffic constructed in 1984. When the northbound Little Bay Bridge was constructed in 1984, the General Sullivan Bridge was closed to motor vehicles and the Turnpike approaches were realigned with the Little Bay Bridges. Much of the current Spaulding Turnpike mainline roadway section still predates the Little Bay Bridges. The most recent substantial roadway modifications were related to the reconstruction of the

Scammell Bridge over the Bellamy River (completed in 1999). That project included improvements to the ramp system from US 4, Boston Harbor Road and Dover Point Road to the Spaulding Turnpike southbound.

Recognizing a need to study potential improvements to address safety concerns and increased congestion, State Senate Bill 152-FN-A (1990) authorized the NHDOT to conduct a study of the approximately 3.5-mile section of the Spaulding Turnpike extending north from Exit 1 (Gosling Road) in Newington and traversing the Little Bay Bridges to (but not including) the Dover Toll Plaza just north of Exit 6. The study was initiated in 1990, but suspended in 1992 to allow completion of the Pease Surface Transportation Master Plan. In 1997, the Newington-Dover Feasibility Study was initiated to conceptually develop both a short-range plan to address existing safety deficiencies, and a range of long-term improvement alternatives to be carried forward for detailed engineering and environmental studies. The feasibility study was completed in 2000.

In 1998, the Route 16 Corridor Protection Study articulated a vision for the corridor (Portsmouth to Errol) to guide future growth and identified a number of planning principles and techniques to address the following major areas of concern: transportation, community design, travel and tourism, and land use and access management. The vision for the corridor and study findings and recommendations resulted from a cooperative effort of working groups of people, who reside and work in the corridor with support from State and regional planners. As part of the study, which underscores the linkage among transportation, economy and land use, 1997 and future (2017) year travel conditions along the corridor – including the Spaulding Turnpike – were evaluated taking into account future changes in land use and transportation improvement projects that were programmed for project development.

The Corridor Protection Study's traffic analysis indicated that while the section of Turnpike north of the Dover Toll Plaza would operate at a satisfactory level of service under future (2017) conditions, the 3.5-mile study area section of Turnpike between the Dover Toll Plaza and Exit 1 (Gosling Road) in Newington is capacity-constrained under both 1997 and 2017 future traffic conditions.

Within the framework of an EIS, this current study identifies, evaluates and recommends a long-term transportation and safety solution for this study area that is supported by community stakeholders and addresses the project's purpose and need.

D. Alternatives Considered

Based upon the results of the initial development, refinement, review and screening of alternatives, the following alternatives were endorsed by the ATF

(June 23, 2004) and were carried forward into the development of this DEIS for further detailed evaluation:

- The No-Build Alternative, which essentially serves as a basis for purposes of comparison with the Build Alternatives.

- Transportation Systems Management (TSM) measures, as described previously, that address current traffic operational and safety problem areas.

- Travel Demand Management (TDM) measures, which will provide alternatives to single occupancy vehicular travel. Specifically, the following measures were carried forward:
  - Rail Alternative 1A – Expanded *Downeaster* Service to Dover
  - Rail Alternative 1B – Expanded *Downeaster* Service to Rochester
  - Rail Alternative 1C – Expanded *Downeaster* Service to Dover (NNEPRA/MaineDOT proposal)
  - Restoration or preservation of the Pease Spur railroad corridor.
  - Bus Alternative 1 – Expanded Intercity Bus Service (Rochester-Boston).
  - Bus Alternative 2 – Expanded Express Bus Service (Rochester-Portsmouth).
  - Bus Alternative 3 – Expanded Local Bus Service.
  - Promotion of employer-based measures utilizing incentives to encourage employees not to commute alone.
  - New park-and-ride facilities in Rochester, Dover, and Durham or Lee.

- Bridge Alternatives – Both located to the west side of the existing Little Bay Bridges:
  - Rehabilitation and widening of the Little Bay Bridges to either six or eight lanes with the General Sullivan Bridge Rehabilitation.
  - Rehabilitation and widening of the Little Bay Bridges to either six or eight lanes with the General Sullivan Bridge Removed.

- Highway Alternatives – Either six or eight lanes along the Turnpike and Little Bay Bridges for the following Alternatives:
  - Alternative 2 in Dover
  - Alternative 3 in Dover
  - Alternative 10A in Newington
  - Alternative 12A in Newington
  - Alternative 13 in Newington

These alternatives were evaluated in more detail and subject to additional agency and public input to determine associated impacts, costs, and permitting issues which are documented in Chapter 4 of the DEIS.

E. Summary of Beneficial and Adverse Effects of Preferred Alternative

E.1 Adverse Effects

The No-Build Alternative serves as the baseline condition for comparing impacts of the Six- and Eight-lane widening alternatives. In general, future impacts would be avoided (*e.g.*, losses of wetlands or impacts on historical resources) with selection of the No-Build Alternative. In the case of some resources, the quality of an environmental resource may actually decline under the No-Build Alternative. For example, microscale (local) air quality problems would be expected to increase with the No-Build Alternatives due to higher levels of congestion and concomitant mobile source air pollution. And, noise generated by the highway will continue to increase even if the No-Build Alternative is implemented. In the case of noise impacts, the Build Alternative includes provisions for the construction of noise barriers in Dover which would not otherwise be constructed to mitigate this problem.

Socio-economics

The Preferred Alternative would require full acquisition of one commercial property and a portion of a second commercial property including a barn, both in Dover. Local tax bases would be reduced by approximately $2.2 million. The resultant effect on Newington's tax revenue would be less than $9,000, while the effect in Dover would be approximately $22,000. Indirect economic effects, *i.e.*, "secondary" or "induced" growth, may result in an additional 1,865 people and 1,897 jobs within the region influenced by this improved segment of the Spaulding Turnpike by the year 2025. This additional growth is a very small fraction of the amount of overall growth predicted for the region even if the Turnpike is not improved (*i.e.,* a total of approximately 92,841 new residents by 2025 under the No-Build Alternative).

Farmlands

There will be no active farmlands affected by the project, although 2.7 acres of prime farmland soils would be lost in Newington. These areas are not and have not been used for agriculture for decades or longer. The potential mitigation for the wetland impacts resulting from the project does involve the permanent conservation of the Tuttle Farm on Dover Point, the oldest continuously-operated farm in the country.

Wetlands

Wetland impacts resulting from the Preferred Alternative are estimated to be 20.4 acres, including impacts from the Turnpike improvements, construction of barriers to mitigate noise impacts, and estuarine impacts resulting from expansion of the bridge piers. None of the project alternatives would affect vernal pools, which are essential breeding habitat for certain types of salamanders and wood frogs. Most of this wetland impact will occur in areas directly adjacent to the existing Turnpike corridor and are therefore already impacted to some degree. Some wetlands, in fact, appear to have formed as a result of the original Turnpike construction. However, the construction of a new interchange in Newington will impact a substantial forested and riparian system associated with Pickering and Railway Brooks.

Restoration of Railway Brook is proposed as mitigation (approximately 2,700 linear feet of perennial stream), and approximately 150 to 200 acres of land preservation in Dover and Newington will help to offset these wetland impacts.

Wildlife

Given that the project area is relatively urbanized, impacts to wildlife habitat will be minor. No travel corridors were identified in the study area, and the vast majority of the area is already fragmented to the point that only relatively common, urban species would be affected. Certain portions of the study area do contain early successional habitat, which is relatively uncommon when compared to the amount of forested cover in the northeastern US. However, there could be some adverse effect resulting from the construction of the proposed Newington interchange due to increased habitat fragmentation.

Threatened and Endangered Species

Only one known location of a state-threatened plant species, the prolific knotweed (*Polygonum prolificum*) was mapped within the limits of the Preferred Alternative. Field searches for this population were unsuccessful, and the population is thought to be extirpated. Habitat for the New England cottontail, a possible candidate for Federal threatened or endangered status, was located by field study, but impacts to the species are expected to be minimal since the habitat quality is marginal.

Surface Waters

The study area is essentially defined by major surface waters including the Bellamy River, the Piscataqua River and the Little Bay. Additionally, six smaller watercourses were identified, all in Newington (Paul Brook, Railway Brook, Pickering Brook, Flagstone Brook and two unnamed streams).

A comparison of the estimated existing and proposed increases in impervious area associated with the Preferred Alternative shows that for most streams, including Railway Brook, Flagstone Brook, Paul Brook and the two unnamed tributaries, there would be a minimal increase in impervious area (*i.e.*, < 1.0 percent of drainage area). Much of the new impervious area in the Newington area would occur in the lower Pickering Brook watershed. The additional impervious area associated with Alternatives 13 (the Preferred Alternative), would represent 4.2 percent of this watershed area. Currently, about 19.0 percent of the lower Pickering Brook watershed (*i.e.*, east of Railway Brook) is estimated to be comprised of impervious area. Based on estimated impervious area changes, Alternative 13 would generate the least amount of impact to the surface waters in the study area.

The various streams on the Newington side of the project area primarily support the more tolerant warm-water fish species and other aquatic organisms. The benthic communities were determined to have low diversity and comprised of the more tolerant species that typically prevail in poor stream habitat conditions or where water quality conditions are diminished due to upstream pollution sources. Given the proposed water quality treatment measures for highway runoff, minimal impacts are anticipated to the aquatic resources in this stream.

Marine Resources

An extensive hydrodynamic model was developed for this EIS to investigate the potential effects of the project on the Little Bay/Great Bay Estuary. The model predicted only minimal changes in tidal conditions as a result of the Preferred Alternative (*i.e.*, the extension of the existing Little Bay Bridge piers). While the model predicts that the pier extension may change tidal maxima, the predicted changes are on the order of 0.1 to 0.2 inches, depending on the tidal condition and the location in the estuary. Similarly, current velocities and directions are expected to change only minimally.

Considering the relatively small magnitude of change that the hydrodynamic model predicts, it is expected that biotic changes will also be minimal. Relative to the total tidal range (approximately 9 feet), this is a negligible change. Additionally, the model demonstrates that this magnitude of change is less than the total change experienced in the estuary prior to the General Sullivan Bridge construction. However, the expansion of the bridge piers will directly impact approximately 17,000 square feet of benthic habitat.

Navigation

Hydrodynamic modeling results indicate that current velocity maxima will increase by no more than 0.5 feet per second, with changes typically only 0.3 feet per second. These potential changes represent only a slight change from the estimated 10 feet per second maximum tidal current under existing conditions.

The model predicts that current speeds will increase in some areas near the piers, while the speeds will decrease in other areas. Additionally, the model predicts that current directions will not change substantially, at least at the scale that can be resolved by the model.

Vertical and lateral clearances in the main navigation channel through the bridge area will be maintained so as not to impact navigation. Taken together with the results of the hydrodynamic modeling, it can be concluded that the project will have only minimal effects on navigation, and should not create situations that are more hazardous than the conditions already present.

Floodplain

The Preferred Alternative would affect a total of 1.2 acres of 100-year floodplain (3.9 acre-feet). The majority of this impact is associated with the expansion of the bridge piers. The floodplain impacts are considered minor in the context of the tremendous volume of Little Bay and will have a negligible effect on the base flood elevations in the area. Any effect on flooding would be influenced by changes to the hydraulic characteristics in the channel (accounted for in the hydrodynamic model), rather than by displacing floodplain volumes.

Groundwater Resources

There are no impacts to public water supply wells associated with the Preferred Alternative. However, the majority of Dover Point and a portion of the study area in Newington are mapped as a stratified-drift aquifer, a landform generally capable of producing substantial yields of groundwater. The Preferred Alternative would result in approximately 14.1 acres of new impervious surface area over these deposits, which might affect the recharge of the aquifer. To help reduce this potential impact, NHDOT will examine the use of infiltration technology during final design of the reconstructed drainage system.

Air Quality

There will be no exceedance of state or federal carbon monoxide (CO) standards with either the Six- or Eight-Lane Alternatives. At the regional level, both alternatives would be in compliance with the 1990 Clean Air Act Amendment and the New Hampshire State Implementation Plan.

The proposed project satisfies regional transportation conformity requirements. The proposed project's air quality emissions were evaluated as an improvement in the NHDOT's State Transportation Improvement Program (STIP) for fiscal years 2005 – 2007, which was reviewed by USEPA and found to be in conformance by the US Department of Transportation.

Noise

During public meetings leading up to the publication of this Draft EIS, noise impacts generated from the Turnpike were frequently raised by residents of the study area as one of their main concerns. A noise model developed for this EIS indicated that several portions of the study area are already adversely affected by noise levels. Predicted noise levels under the 2025 Build Alternative would not create any new impacts, but would perpetuate the problem. Noise barriers have therefore been proposed where practicable based on effectiveness and cost. Four such barriers are planned in Dover to mitigate noise impacts.

Community Resources

Two important recreational resources are located within the study area – Hilton Park and Bayview Park – both in Dover. The Preferred Alternative would avoid acquisition of new right-of-way from Hilton Park, although temporary impacts to the park would be unavoidable during construction. New right-of-way and grading would be required on the Bayview Park property (a.k.a., the Bellamy River Wildlife Management Area, owned by the NHF&GD), totaling less than ½ acre. Sidewalks to the park and a new driveway are proposed to improve accessibility to the park.

Cultural Resources

The Preferred Alternative manages to avoid direct impacts to all but a few historic properties (*i.e.*, properties determined eligible for listing on the National Register of Historic Places). Most notably, the Preferred Alternative proposes to rehabilitate the historic General Sullivan Bridge as a bicycle and pedestrian facility, preserving a valued and highly significant historic resource . Other affected properties include the Beane Farm, Isaac Dow House and the Portsmouth Water Booster Station in Newington and the Ira Pinkham House in Dover. While incidental property impacts occur in all of these cases, only one structure, a barn associated with the Ira Pinkham House, will be directly impacted by the project.

In addition to the historic structures, much of the study area has been determined sensitive or probably sensitive for archaeological resources, both historic and Native American. The Preferred Alternative would affect up to 18 such areas (approximately 44 acres of disturbance). Further information on these potential resources will be compiled following the public hearing as more detailed design is developed and the potentially impacted areas solidified.

Hazardous Materials

Given the long history of land use in the area, particularly the commercial/industrial and military use in Newington, there is potential for the

project to affect properties with a history of petroleum and other hazardous materials contamination. For the most part, the Preferred Alternative avoids direct impacts to such properties, and no impact to human or ecological health is anticipated. Up to 20 properties potentially impacted by the Selected Alternative may be further studied following the public hearing in order to accurately define the risk relative to the possibility of encountering contamination from hazardous materials.

E.2 Beneficial Effects

The Preferred Alternative would result in a number of beneficial effects.

Safety and Traffic Operations

The Preferred Alternative will result in safer and more efficient traffic operations in comparison to the No-Build Alternative.

- Substandard shoulder areas on the Little Bay Bridges and bridge approaches will be eliminated.
- Interchanges will be consolidated (Exits 2 and 3; Exits 5 and 6), improving spacing between interchanges, eliminating substandard geometry and providing the necessary traffic management lanes between Exits 3 and 6 to enable safe lane changes required by traffic entering and exiting the Turnpike. Traffic congestion and delays will be reduced and air quality will be improved.
- Connections to the Turnpike system will be improved at Exit 3 (Woodbury Avenue/Tradeport) and Exit 6 (US 4/Dover Point Road) improving system efficiency and eliminating circuitous travel.
- Local roadway connections will be improved:
  - Woodbury Avenue connection to Arboretum Drive (Tradeport).
  - Extension of Shattuck Way (Newington) and conversion to two-way traffic.
  - Two-way Hilton Park connector adjacent to channel.
  - Two-way connector between Spur Road and Boston Harbor Road (Dover).
- Improved pedestrian connections will be provided:
  - Connecting the east and west sides of Hilton Park.
  - Rehabilitation of the General Sullivan Bridge will maintain the important connection across the Bay.
  - Connecting the Spur Road and Boston Harbor Road neighborhoods.
- Future planning and accommodation for a rail connection traversing above the Turnpike between the Newington Branch line and the Pease Tradeport.

- Reduced travel demand and improved air quality from employer-based travel demand management (TDM) programs during construction, as well as, expanded bus service.
- Travel time during the peak hours of the day will be improved from the current approximately 10 minutes required to travel the 3.5-mile section of the Turnpike to approximately 4 minutes. In the future (2025), travel time is expected to be reduced from approximately 21 minutes (No-Build) to approximately 4 minutes with the Preferred Alternative.

Environmental Benefits

In addition to the safety and traffic operational benefits summarized above, certain beneficial environmental effects will result from the improved traffic operations of the Turnpike. For example, the reduced congestion will help to reduce transportation-related air emissions, which, at the local scale, are directly related to traffic congestion. Similarly, transportation-related energy consumption is reduced in areas of decreased congestion.

Project-related environmental mitigation will help to offset impacts to natural resources. For example, as discussed previously, approximately 150 to 200 acres of land will be permanently protected as a result of the project's proposed mitigation. Railway Brook, a former branch of Pickering Brook, will be restored to replace lost stream and wetland habitat. Also, protection of the Tuttle Farm will help preserve an historic part of New Hampshire's agricultural heritage.

Other substantial beneficial elements include:

- Noise barriers in Dover to alleviate highway-related noise impacts to residential areas;
- Rehabilitation of the historic General Sullivan Bridge; and
- Eleven extended detention basins to treat stormwater runoff and improve water quality.

F. Issues and Areas of Controversy

Through the course of numerous public meetings (16 Advisory Task Force meetings, seven Public Informational meetings, and a Dover City Council meeting), input has been received that favored various aspects of the improvement alternatives. Major issues have been contemplated concerning access, the configuration of the interchanges, environmental impacts, right-of-way requirements, the elevation of the Turnpike (opposition expressed towards elevating the Turnpike due to associated noise and visual impacts), the fate of the General Sullivan Bridge (whether to remove or rehabilitate), six lanes versus eight lanes on the Little Bay Bridges, and a multi-modal approach to meeting transportation needs.

General Sullivan Bridge

One of the primary issues throughout the EIS process has been the fate of the General Sullivan Bridge. The Bridge has not been used to carry vehicular traffic since the expansion of the Little Bay Bridge in 1984, and has been in a state of increasing deterioration for some time. The US Coast Guard required demolition of the General Sullivan Bridge (once it no longer was used for transportation purposes) as a condition of its approval of the expansion of the Little Bay Bridge. However, the bridge is considered one of the most historic in New Hampshire, and perhaps even the northeast. It therefore is protected under state and federal law. After consideration of the costs and benefits of rehabilitation and reuse of the bridge as compared to its demolition, the NHDOT identified reuse of the bridge, although more costly, as the Preferred Alternative. Although widely supported by the FHWA, NHDHR, the City of Dover, Strafford Regional Planning Commission, Advisory Task Force, and members of the public, this decision has been questioned by some who feel that the extra funding should go to other important projects in the state. This sentiment is reinforced by the fact that the state's Ten-Year Transportation Improvement Plan is substantially under funded.

Dover Toll Plaza

During the scoping phase of the EIS, it was determined that toll operations at the Dover plaza, and potential impacts of these operations on traffic operations within the study area, should not be part of the scope of study. This decision raised questions from some members of the public, who felt that the Toll Plaza should be part of the study area. However, evaluation of toll operations and revenue require a systematic review and approach.

The Dover Tolls, therefore, cannot be considered without examination of the entire toll system, which was determined to be unreasonable for this project. Changes in toll plaza location, pricing and operations require state legislative action. Recent implementation of the E-Z Pass system, which is a statewide and systemwide project, should reduce delay and congestion at all toll plazas, including the Dover facility. Additionally, previous and current traffic data indicate that congestion problems are limited to areas south of the Toll Plaza.

Access at Nimble Hill Road

At the local level, a number of concerns were expressed regarding access to the Turnpike from the existing gasoline station/convenience store adjacent to the southbound Turnpike roadway near Nimble Hill Road. Although the Turnpike is a limited access highway, this facility (an ExxonMobil station) does have direct access to the Exit 4 ramps. In order to improve safety in this area, all of the Newington alternatives eliminated this direct access, which raised concerns about how this change might affect the business. The Preferred Alternative will

allow continued access to this property via a local access road south of the property.

Noise

Another local issue was the impact of the Turnpike on noise levels in the two communities. Both Newington and Dover residents repeatedly expressed concerns about these noise levels. The noise modeling showed that a number of residences in Dover currently exceed impact thresholds established in FHWA policy on noise. Only one impacted sensitive receptor was identified in Newington, even though some residents quite far from the Turnpike had complained about noise levels. As a result of the analysis, four permanent noise barriers in Dover (none in Newington as no areas met the economic criteria) are proposed as mitigation, and the grade of the new Turnpike mainline is proposed to be generally maintained at the same level as the existing.

Aesthetics

Viewsheds from the widened Little Bay Bridges and Turnpike, and from nearby Dover residences will be affected to varying degrees. Southbound riverscape views to the east will be impacted by the increased cross-section width of the Turnpike, as well as northbound views of Little Bay. Proposed noise barriers in Dover will create a widened tunnel-like view to the motorist and affect the view of Pomeroy Cove. In addition, these barriers, while offering noise abatement to residents, will restrict views of the highway.

Hilton Park

Hilton Park was identified by the public as a valuable recreational resource and its protection emphasized during early public meetings. Planning and preliminary design endeavored to avoid impacts to Hilton Park, and to enhance the park where possible. By widening the Little Bay Bridges to the west side of the existing bridges, impacts to Hilton Park from the bridge and Turnpike widening were avoided. The current northbound access to Hilton Park will be modified, however. Exit 5 will be eliminated under the Preferred Alternative due to its proximity to Exit 6 which currently creates unacceptable traffic operations and safety conditions. These conditions notwithstanding, the upgrade of Exit 5 geometry to meet minimum standards, would have impacted both Hilton Park and the Wentworth Terrace neighborhood, which was determined to be an unacceptable solution. Rather, the existing pedestrian and one-way vehicular connection traversing under the Turnpike adjacent to the channel, which links both sides of the Park, will be upgraded to provide a two-way vehicular connection to Dover Point Road and Exit 6. In addition, the pedestrian connection linking the pedestrian/path system in the park on both sides of the Turnpike will be improved.

Secondary Growth

NHDES and the USEPA have expressed concerns that suburban development in the region would accelerate as a result of improved highway capacity. This concern is based on the perception that the Spaulding Turnpike within the study area acts as a transportation bottleneck and therefore serves to constrain economic development north of the Little Bay Bridges. To assess this concern, the Draft EIS assesses potential "indirect" economic effects, including a discussion of potential land use impacts.

An economic forecasting and policy analysis model was used to evaluate indirect social and economic impacts on 33 communities located in the socio-economic study area region. A No-Build analysis revealed that the present rate of fairly brisk growth (in terms of population, employment and income) experienced by these communities since the 1970s would likely continue, but at a slightly slower rate. However, an evaluation of possible indirect effects due to improvements on the Spaulding Turnpike indicated a small impact on population and employment growth rates, and the corresponding indirect land development and environmental impacts.

G. Other Governmental Actions

The NHDOT and FHWA are not aware of any additional federal actions or any state or local government actions within the project study area that would conflict with the proposed action.

H. Major Unresolved Issues

Following the extensive public participation process leading up to the publication of this Draft EIS, there are no major unresolved issues associated with the project.

I. Federal and State Actions Required for the Implementation of Proposed Action

- An Individual Wetland Permit application has been submitted jointly to the US Army Corps of Engineers (USACOE) and New Hampshire Department of Environmental Services (NHDES) for their approval. This project's development has followed the USACOE's Highway Methodology, which is designed to integrate their Section 404 permitting process with the requirements of the National Environmental Policy Act (NEPA).

- A joint Public Hearing with the NHDES and USACOE will be conducted to facilitate the issuance of the Section 404 wetland permit and NHDES dredge and fill permit.

- A Section 401 Water Quality Certificate is required from NHDES before the Section 404 permit can be issued. This review will determine whether the proposed action meets all state water quality standards.

- The project will require a permit from the US Coast Guard (USCG) under its permitting authority pursuant to Section 9 of the Rivers and Harbors Act of 1899 and the General Bridge Act of 1946. Under the General Bridge Act of 1946, the USCG is responsible to preserve the public right of navigation and to prevent interference with interstate or foreign commerce. Their review will require that the bridges provide for the reasonable needs of navigation, as well as the reasonable needs of land traffic (*i.e.*, highway users).

- Pursuant to the National Pollution Discharge Elimination System (NPDES), a Notice of Intent (NOI) application to the US Environmental Protection Agency (USEPA) for a General Permit for Construction Activity is required before construction can begin. A Stormwater Pollution Prevention Plan consistent with NHDOT Standard Specifications, which incorporate Best Management Practices (BMPs) for minimizing soil erosion and sediment movement, will be developed and submitted with this application.

- Concurrence by the National Marine Fisheries Service (NMFS) that the Selected Alternative will either not have an "adverse effect" or that the "adverse effect" is "not substantial" on Essential Fish Habitat (EFH) is required.

- Under Section 4(f) of the US Department of Transportation Act as amended by the Federal-Aid Highway Act of 1968 (Public Law 90-495, 49 USC 1653), FHWA will need to make a determination that there is no feasible and prudent alternative to the use of land from Hilton Park, Bayview Park, and the affected historic resources before the project can advance.

- A Record of Decision (ROD) issued by FHWA is required before this project can proceed to final design. The ROD is issued no sooner than 30 days after release of the Final EIS.

Section 3.3 Socio-Economic Excerpts

3.3 Socio-Economic Conditions

3.3.1 Socio-Economic Study Area

The socio-economic study area for this project has both a regional and local component. The broader regional area includes 33 municipalities within the tri-county area of Strafford, Rockingham and Carroll Counties, in the southeast portion of New Hampshire. The more localized project study area is as described in Chapter 1 and includes portions of the Town of Newington and the City of Dover that border the 3.5-mile section of the Spaulding Turnpike being evaluated for upgrading. These study areas are shown in **Figures 1.2-2 and 1.3-1**.

The 33-community socio-economic study area was used as a basis to collect and analyze regional socio-economic data in order to provide a context within which to evaluate the proposed highway improvement project and its potential secondary impacts. The socio-economic study area includes the New Hampshire portion of the Portsmouth-Rochester, NH-ME Primary Metropolitan Statistical Area (PMSA), as well as seven additional towns that lie outside the PMSA. This PMSA designation was established by the US Office of Management and Budget (OMB) based on population thresholds reached within the region and its core cities, as well as the determination that "adjacent communities within the region have a high degree of social and

economic integration with these core areas." Beginning in 2000, all metropolitan areas were redefined as core based statistical areas (CBSAs).

As of June 2003, criteria were established that divided the Portsmouth-Rochester PMSA into newly created New England city and town areas (NECTAs). These NECTAs can be further defined as either metropolitan or micropolitan statistical areas. Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. Each micropolitan statistical area must have at least one urban cluster of at least 10,000 but less than 50,000 population. Based on these new definitions, the former Portsmouth-Rochester, NH-ME PMSA has been divided into two primary subareas that include the Portsmouth, NH ME Metropolitan NECTA and the Rochester Dover, NH-ME Metropolitan NECTA. However, these two NECTAs do not include the exact configuration of towns that existed under the former PMSA designation.

While these newly created NECTAs will facilitate future analysis, data gathered by the Census Bureau and other agencies have not yet been aggregated based on these revised geographic boundaries. Therefore, for purposes of this analysis, the 1999 PMSA definition, combined with several additional communities, was determined to be the most appropriate socio-economic study area for conducting a review of baseline conditions related to the proposed highway improvement project.

Certain types of economic data presented in this report, such as employment by industry, rely on published information at the PMSA level as being the best available data due to privacy restrictions. In some instances, the PMSA is also referred to as the Portsmouth Labor Market Area (LMA), which is the name used by New Hampshire Employment Security (NHES) for the same geographic region.

The socio-economic study area is limited to New Hampshire communities for several reasons. In Journey-to-Work data compiled by the US Census Bureau (see Section 3.3.6), it was noted that Strafford County residents commuting to work in Maine declined 36% (to 2,825) and Rockingham County residents commuting to work in Maine also declined by 36% (to 1,713) between 1990 and 2000.

During the same time period the number of Maine residents commuting to work in Strafford County increased by less than 1% between 1990 and 2000 (4,467 in 2000), but more than 7,760 residents of Maine (an increase of 32%) worked in Rockingham County in 2000.

In evaluating economic and social impacts of the proposed widening of the Spaulding Turnpike, an important aspect relating to possible impacts was use of the Little Bay Bridges for travel between work and home.

Consequently, the key factor for including Maine in the study area was the use of the Little Bay Bridges by residents of Strafford County traveling to work in Maine and by Maine residents commuting to work in Strafford County.

A detailed evaluation of journey to work patterns indicated that approximately 30% of Strafford County residents commuting to Maine worked in communities adjacent to Strafford County (Acton, Alfred, Berwick, Eliot, Lebanon, North Berwick, Sanford and South Berwick). In order to reach these locations, alternative roadways, rather than the Little Bay Bridges, would likely be used to commute between home and work. The other large work location for Strafford County residents was Kittery, Maine (40% of Strafford County residents commute to Maine or 1,206 individuals). Once again an examination of journey to work data indicated that most of the Strafford County residents that worked in Kittery lived in Strafford County communities adjacent to Maine (Dover, Farmington, Rochester, Rollinsford and Somersworth – 879 individuals or 72% of Strafford County workers that commute to Kittery). It is expected that these Strafford County residents would use a variety of local and state roads rather than the Little Bay Bridges, to travel between Kittery and home. In a similar manner it was determined that many of the residents of Maine that commute to work in Strafford County, are employed in New Hampshire communities (Dover, Farmington, Rochester, Rollinsford and Somersworth) adjacent to Maine. For example, 35% of Maine commuters that work in Strafford County live in Berwick, South Berwick and Eliot.

Based on this evaluation of journey to work data it was determined that the study area should not include Maine communities.

3.3.2 Population and Demographic Characteristics

3.3.2.1 Historical Population Trends

Changes in total population for the socio-economic study area were examined over the last 30 years in order to identify long-term trends within the region. As illustrated in Table 3.3-1, the study area experienced growth within all three decades between 1970 and 2000. However, there was a considerable decline in the rate of growth during the last 10-year period from

Table 3.3-1
Total Population 1970-2000
Socio-Economic Study Area

	Population				Change				% Change				Avg. Annual Change	
	1970	1980	1990	2000	70-80	80-90	90-00	70-00	70-80	80-90	90-00	70-00	90-00	70-00
Barrington	1,865	4,404	6,164	7,475	2,539	1,760	1,311	5,610	136.1%	40.0%	21.3%	300.8%	1.9%	4.7%
Dover	20,850	22,377	25,042	26,884	1,527	2,665	1,842	6,034	7.3%	11.9%	7.4%	28.9%	0.7%	0.9%
Durham	8,869	10,652	11,818	12,664	1,783	1,166	846	3,795	20.1%	10.9%	7.2%	42.8%	0.7%	1.2%
Farmington	3,588	4,630	5,739	5,774	1,042	1,109	35	2,186	29.0%	24.0%	0.6%	60.9%	0.1%	1.6%
Lee	1,481	2,111	3,729	4,145	630	1,618	416	2,664	42.5%	76.6%	11.2%	179.9%	1.1%	3.5%
Madbury	704	987	1,404	1,509	283	417	105	805	40.2%	42.2%	7.5%	114.3%	0.7%	2.6%
Middleton	430	734	1,183	1,440	304	449	257	1,010	70.7%	61.2%	21.7%	234.9%	2.0%	4.1%
Milton	1,859	2,438	3,691	3,910	579	1,253	219	2,051	31.1%	51.4%	5.9%	110.3%	0.6%	2.5%
New Durham	583	1,183	1,974	2,220	600	791	246	1,637	102.9%	66.9%	12.5%	280.8%	1.2%	4.6%
Rochester	17,938	21,560	26,630	28,461	3,622	5,070	1,831	10,523	20.2%	23.5%	6.9%	58.7%	0.7%	1.6%
Rollinsford	2,273	2,319	2,645	2,648	46	326	3	375	2.0%	14.1%	0.1%	16.5%	0.0%	0.5%
Somersworth	9,026	10,350	11,249	11,477	1,324	899	228	2,451	14.7%	8.7%	2.0%	27.2%	0.2%	0.8%
Strafford	965	1,663	2,965	3,626	698	1,302	661	2,661	72.3%	78.3%	22.3%	275.8%	2.0%	4.5%
Subtotal Strafford	**70,431**	**85,408**	**104,233**	**112,233**	**14,977**	**18,825**	**8,000**	**41,802**	**21.3%**	**22.0%**	**7.7%**	**59.4%**	**0.7%**	**1.6%**
Brentwood	1,468	2,004	2,590	3,197	536	586	607	1,729	36.5%	29.2%	23.4%	117.8%	2.1%	2.6%
East Kingston	838	1,135	1,352	1,784	297	217	432	946	35.4%	19.1%	32.0%	112.9%	2.8%	2.6%
Epping	2,356	3,460	5,162	5,476	1,104	1,702	314	3,120	46.9%	49.2%	6.1%	132.4%	0.6%	2.9%
Exeter	8,892	11,024	12,481	14,058	2,132	1,457	1,577	5,166	24.0%	13.2%	12.6%	58.1%	1.2%	1.5%
Greenland	1,784	2,129	2,768	3,208	345	639	440	1,424	19.3%	30.0%	15.9%	79.8%	1.5%	2.0%
Hampton	8,011	10,493	12,278	14,937	2,482	1,785	2,659	6,926	31.0%	17.0%	21.7%	86.5%	2.0%	2.1%
Hampton Falls	1,254	1,372	1,503	1,880	118	131	377	626	9.4%	9.5%	25.1%	49.9%	2.3%	1.4%
Kensington	1,044	1,322	1,631	1,893	278	309	262	849	26.6%	23.4%	16.1%	81.3%	1.5%	2.0%
New Castle	975	936	840	1,010	-39	-96	170	35	-4.0%	-10.3%	20.2%	3.6%	1.9%	0.1%
Newfields	843	817	888	1,551	-26	71	663	708	-3.1%	8.7%	74.7%	84.0%	5.7%	2.1%
Newington	798	716	990	775	-82	274	-215	-23	-10.3%	38.3%	-21.7%	-2.9%	-2.4%	-0.1%
Newmarket	3,361	4,290	7,157	8,027	929	2,867	870	4,666	27.6%	66.8%	12.2%	138.8%	1.2%	2.9%

Table 3.3-1 (continued)

	Population				Change				% Change				Avg. Annual Change	
	1970	1980	1990	2000	70-80	80-90	90-00	70-00	70-80	80-90	90-00	70-00	90-00	70-00
North Hampton	3,259	3,425	3,637	4,259	166	212	622	1,000	5.1%	6.2%	17.1%	30.7%	1.6%	0.9%
Northwood	1,526	2,175	3,124	3,640	649	949	516	2,114	42.5%	43.6%	16.5%	138.5%	1.5%	2.9%
Nottingham	952	1,952	2,939	3,701	1,000	987	762	2,749	105.0%	50.6%	25.9%	288.8%	2.3%	4.6%
Portsmouth	25,717	26,254	25,925	20,784	537	-329	-5,141	-4,933	2.1%	-1.3%	-19.8%	-19.2%	-2.2%	-0.7%
Rye	4,083	4,508	4,612	5,182	425	104	570	1,099	10.4%	2.3%	12.4%	26.9%	1.2%	0.8%
Stratham	1,512	2,507	4,955	6,355	995	2,448	1,400	4,843	65.8%	97.6%	28.3%	320.3%	2.5%	4.9%
Subtotal Rockingham	**68,673**	**80,519**	**94,832**	**101,717**	**11,846**	**14,313**	**6,885**	**33,044**	**17.2%**	**17.8%**	**7.3%**	**48.1%**	**0.7%**	**1.3%**
Brookfield	198	385	518	604	187	133	86	406	94.4%	34.5%	16.6%	205.1%	1.5%	3.8%
Wakefield	1,420	2,237	3,057	4,252	817	820	1,195	2,832	57.5%	36.7%	39.1%	199.4%	3.4%	3.7%
Subtotal Carroll	**1,618**	**2,622**	**3,575**	**4,856**	**1,004**	**953**	**1,281**	**3,238**	**62.1%**	**36.3%**	**35.8%**	**200.1%**	**3.1%**	**3.7%**
Study Area Total	**140,722**	**168,549**	**202,640**	**218,806**	**27,827**	**34,091**	**16,166**	**78,084**	**19.8%**	**20.2%**	**8.0%**	**55.5%**	**0.8%**	**1.5%**
County Totals														
Carroll County	18,548	27,931	35,410	43,666	9,383	7,479	8,256	25,118	50.6%	26.8%	23.3%	135.4%	2.1%	2.9%
Rockingham County	138,951	190,345	245,845	277,359	51,394	55,500	31,514	138,408	37.0%	29.2%	12.8%	99.6%	1.2%	2.3%
Strafford County	70,431	85,408	104,233	112,233	14,977	18,825	8,000	41,802	21.3%	22.0%	7.7%	59.4%	0.7%	1.6%

Source: US Census

NOTE: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

1990 to 2000. There was also a decrease in the actual number of people added to the total base population during this time period. Overall, there were net increases of approximately 27,800 and 34,100 during the 1970s and 1980s, respectively, as compared with only 16,200 during the 1990s. This represents growth rates for each decade of 19.8 percent, 20.2 percent, and 8 percent, respectively. Total growth within the study area between 1970 and 2000 was 78,000, an increase of 55.5 percent, which represents an average annual rate of growth of 1.5 percent. During the same time period (1970 – 2000), population in the State of New Hampshire increased by over 498,000. This represents an increase of 68 percent, or approximately a 2.3 percent average annual rate of growth.

Within the Strafford County portion of the socio-economic study area, the City of Rochester absorbed the largest portion of total population growth adding approximately 10,500 people between 1970 and 2000. Other communities that experienced consistent population gains in all three decades included the Town of Barrington and the City of Dover, which had population increases of approximately 5,600 and 6,000, respectively, during that 30-year time period. The Town of Durham also experienced substantial population growth, some portion of which is attributable to students enrolled at the University of New Hampshire (UNH). Approximately 4,500 residents, or 36 percent of the town's total population, were identified by the Census Bureau as residing in non-institutional group quarters in 2000. This represents only a portion of the students residing in the community who attend the University; the remainder live in conventional housing and thus are not as readily identifiable within the Census' enumeration. In the Rockingham County area, the Town of Hampton had the largest population gain adding almost 7,000 people between 1970 and 2000. Other notable increases were also experienced in the communities of Exeter, Stratham, Newmarket, and Epping.

A relatively small percentage of the study area's total population was identified as residing in group quarters. Approximately 7,500 people, or 3.6 percent of the population, lived in group quarters as of 2000. However, only 2,200 of that total (29 percent) were housed in institutional facilities while the remaining 5,300 (71 percent) lived in non-institutional facilities. The majority of this latter category, approximately 4,500, was associated with UNH, as discussed previously in this section.

One anomaly in the data involved population change in the City of Portsmouth. The city experienced a decrease in population between 1980 and 2000, with a decline of 5,141 people during the latter decade. The majority of this population loss is most likely attributable to the closing and realignment of Pease Air Force Base, now Pease International Tradeport, which was decommissioned in 1991. Prior to its closure, total military personnel and dependents residing on the Base numbered 4,666. These residents would

have been included in Portsmouth's population base for census enumeration purposes. Approximately 6,000 additional personnel and dependents associated with the facility resided off the base in other communities in southeastern New Hampshire and southern Maine. Although the exact decline in the region's population associated with the Base closing cannot be determined, it no doubt was a substantial factor in reducing the effective rate of growth within the study area between 1990 and 2000. However, this decline in population has since been reversed by growth that occurred in the latter part of the decade.

Table 3.3-1 also presents the Strafford, Rockingham and Carroll County subregions of the study area's total population growth. It is interesting to note that population growth in Strafford County, in absolute numbers, has consistently exceeded that of the Rockingham County portion of the study area for all three decades examined. The data also illustrates that while the population growth rate of Rockingham County as a whole has generally exceeded Strafford County's rate of growth, the greatest proportion of Rockingham's growth has occurred in communities that are located outside of the regional study area. A further intricacy of this trend is revealed when the population loss of approximately 5,100 experienced by the City of Portsmouth during the 1990s is accounted for by eliminating this negative growth figure from the remainder of the Rockingham portion of the study area. Doing so reveals that population in the remaining communities actually increased by approximately 12,000, which exceeded Strafford County's increase of 8,000 for the same time period. This suggests that the trends of the 1970s and 1980s, where population growth in the Strafford portion of the study area exceeded that of Rockingham's, have moderated somewhat with both subregions of the study area moving toward more equivalent population gains. In fact, without Portsmouth's loss during the 1990s, the Rockingham portion of the study area grew at an average annual rate of 1.2 percent (versus 0.7 percent with Portsmouth included), which exceeded Strafford's annual rate of growth of 0.7 percent during that decade.

Only two towns in Carroll County - Brookfield and Wakefield - are included in the regional study area. The total population within these two towns increased by approximately 3,200 between 1970 and 2000, with Wakefield absorbing the largest proportion (2,832) of that growth. Although Carroll County has the smallest total population (43,666 in 2000) of the three counties that included communities within the study area, it had the highest rate of growth of the three over the last 30 years, as well as during some of the intermediate decades for which data is presented in Table 3.3-1. In fact, Carroll County's actual population increase of 8,256 between 1990 and 2000 slightly exceeded that of Strafford County's increase of 8,000 during that decade. This is an indication that real estate market conditions within Strafford and Rockingham Counties have fostered increased residential growth in the northern portion of the region, where more affordable housing

is still available in proximity to the metropolitan employment centers in the southern portion of the study area.

3.3.2.2 Households

The trends associated with household growth within the study area present a notable contrast to those related to population changes that were discussed above. Although both the rate of population and household growth has slowed over the last few decades, the rate of new household formation has decreased at a considerably slower pace, as exhibited in Table 3.3-2. For example, population in the study area increased by 20.2 percent between 1980 and 1990, while the number of households increased by 28.1 percent. During this time period population growth represented approximately 70 percent of household growth. In the following decade, between 1990 and 2000, population and household growth rates in the study area dropped to 8 percent and 13.9 percent respectively. As a result, population growth represented only 57 percent of household growth during that decade. The change in these rates of growth over the last two decades is a reflection of trends relating to decreasing household size.

Support of this trend is represented by changes in the number of persons per household, which is illustrated in Table 3.3-2. As the data shows, the average number of persons per household decreased in almost every study area community between 1990 and 2000. The only municipalities that experienced an increase in household size were Durham, Brentwood, New Castle, Newfields, and Stratham. Durham's increase may be attributable to students at UNH, who typically share housing units in a communal fashion, as opposed to an increase in the size of conventional family households in the community.

This decline in household size has several potential implications for long-term planning related to transportation facilities. The first is that a continued decline in population growth for the study area, which is discussed in a subsequent section, will not necessarily result in a corresponding decrease in the number of new households and new housing units created within the study area in the future. The second is that a decreasing household size may reduce the average number of vehicle trips typically associated with specific housing types such as single and multi-family dwellings, however, verification of this conclusion would require a more detailed survey of household commuting characteristics in the study area.

Table 3.3-2
Total Households and Household Size 1980-2000
Socio-Economic Study Area

	Total Households							Average Persons Per Household			
				Change		% Change				Change	% Change
	1980	1990	2000	80-90	90-00	80-90	90-00	1990	2000	90-00	90-00
Barrington	1,502	2,217	2,767	715	550	47.6%	24.8%	2.80	2.70	-0.10	-3.6%
Dover	8,307	10,346	11,542	2,039	1,196	24.5%	11.6%	2.36	2.26	-0.10	-4.2%
Durham	2,072	2,365	2,887	293	522	14.1%	22.1%	2.70	2.80	0.10	3.7%
Farmington	1,579	2,067	2,134	488	67	30.9%	3.2%	2.77	2.69	-0.08	-2.9%
Lee	751	1,278	1,469	527	191	70.2%	14.9%	2.92	2.81	-0.11	-3.8%
Madbury	340	489	535	149	46	43.8%	9.4%	2.87	2.82	-0.05	-1.7%
Middleton	247	398	526	151	128	61.1%	32.2%	2.97	2.74	-0.23	-7.7%
Milton	808	1,301	1,440	493	139	61.0%	10.7%	2.84	2.72	-0.12	-4.2%
New Durham	423	684	805	261	121	61.7%	17.7%	2.89	2.75	-0.14	-4.8%
Rochester	7,703	10,196	11,397	2,493	1,201	32.4%	11.8%	2.58	2.47	-0.11	-4.3%
Rollinsford	776	979	1,043	203	64	26.2%	6.5%	2.70	2.54	-0.16	-5.9%
Somersworth	3,790	4,374	4,704	584	330	15.4%	7.5%	2.56	2.43	-0.13	-5.1%
Strafford	558	994	1,281	436	287	78.1%	28.9%	2.99	2.82	-0.17	-5.7%
Subtotal Strafford	**28,856**	**37,688**	**42,530**	**8,832**	**4,842**	**30.6%**	**12.8%**				
Brentwood	549	752	906	203	154	37.0%	20.5%	2.92	3.01	0.09	3.1%
East Kingston	366	472	625	106	153	29.0%	32.4%	2.88	2.85	-0.03	-1.0%
Epping	1,158	1,859	2,053	701	194	60.5%	10.4%	2.74	2.66	-0.08	-2.9%
Exeter	4,215	5,025	5,900	810	875	19.2%	17.4%	2.43	2.32	-0.11	-4.5%
Greenland	711	1,020	1,211	309	191	43.5%	18.7%	2.71	2.63	-0.08	-3.0%
Hampton	4,118	4,992	6,474	874	1,482	21.2%	29.7%	2.43	2.28	-0.15	-6.2%
Hampton Falls	466	532	711	66	179	14.2%	33.6%	2.83	2.64	-0.19	-6.7%
Kensington	437	556	657	119	101	27.2%	18.2%	2.92	2.87	-0.05	-1.7%
New Castle	338	341	413	3	72	0.9%	21.1%	2.16	2.42	0.26	12.0%
Newfields	276	300	517	24	217	8.7%	72.3%	2.96	3.00	0.04	1.4%
Newington	252	292	293	40	1	15.9%	0.3%	2.64	2.55	-0.09	-3.4%
Newmarket	1,757	2,924	3,373	1,167	449	66.4%	15.4%	2.45	2.37	-0.08	-3.3%
North Hampton	1,217	1,374	1,660	157	286	12.9%	20.8%	2.65	2.57	-0.08	-3.0%

Table 3.3-2 (continued)

	Total Households							Average Persons Per Household			
				Change		% Change				Change	% Change
	1980	1990	2000	80-90	90-00	80-90	90-00	1990	2000	90-00	90-00
Northwood	786	1,148	1,347	362	199	46.1%	17.3%	2.72	2.70	-0.02	-0.7%
Nottingham	649	1,032	1,331	383	299	59.0%	29.0%	2.83	2.78	-0.05	-1.8%
Portsmouth	9,498	10,311	9,933	813	-378	8.6%	-3.7%	2.40	2.03	-0.37	-15.4%
Rye	1,737	1,918	2,174	181	256	10.4%	13.3%	2.38	2.35	-0.03	-1.3%
Stratham	811	1,880	2,308	1,069	428	131.8%	22.8%	2.72	2.75	0.03	1.1%
Subtotal Rockingham	**29,341**	**36,728**	**41,886**	**7,387**	**5,158**	**25.2%**	**14.0%**				
Brookfield	139	205	239	66	34	47.5%	16.6%	2.82	2.53	-0.29	-10.3%
Wakefield	856	1,195	1,682	339	487	39.6%	40.8%	2.61	2.53	-0.08	-3.1%
Subtotal Carroll	**995**	**1,400**	**1,921**	**405**	**521**	**40.7%**	**37.2%**				
Study Area Total	**59,192**	**75,816**	**86,337**	**16,624**	**10,521**	**28.1%**	**13.9%**				
County Totals											
Carroll County	11,084	14,283	18,387	3,199	4,104	28.9%	28.7%	2.45	2.34	-0.11	-4.5%
Rockingham County	66,471	89,259	104,586	22,788	15,327	34.3%	17.2%	2.72	2.63	-0.09	-3.3%
Strafford County	28,856	37,688	42,531	8,832	4,843	30.6%	12.9%	2.60	2.50	-0.10	-3.8%

Source: US Census
Note: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

3.3.2.3 Income and Economic Need

The state's median household income increased by approximately 36 percent between 1990 and 2000, as exhibited in Table 3.3-3. Each of the three counties in the study area either equaled or exceeded that rate of increase over the last decade. However, in actual terms, both Carroll and Strafford County had median income levels that were equivalent to only 80.0 percent and 90.5 percent respectively, of the statewide median. In contrast, Rockingham County exceeded the state's median by approximately 18 percent in 2000.

At the municipal level, the table also presents each community's 2000 median income as a percentage of its respective county's median income level. Of those that were below the county median, all were within 90 percent of that benchmark. The lowest percentages were registered in Farmington and Rochester at 91.4 percent and 90.6 percent respectively.

The same comparison for Rockingham County municipalities in the study area shows that five of the 16 communities had household incomes below the county-wide median (only a subset of Rockingham County communities were included in the socio-economic study area). Four of these had incomes that were below 90 percent of the county's median. However, incomes in all four towns still exceeded the county-wide medians for Strafford County and Carroll County. In Carroll County, the median household incomes of both Brookfield and Wakefield exceeded their county's median income level in 2000.

With regard to the change in *per capita* income levels, both Carroll and Rockingham County's growth rates, 56.2 percent and 50.6 percent respectively, were slightly higher than the statewide increase of 49.4 percent between 1990 and 2000. Strafford County's rate of increase however, lagged behind at 46.3 percent. Strafford County also had a correspondingly greater number of municipalities in the study area that had *per capita* incomes that were below the county-wide average.

One indication of economic need within a community is the number of people with incomes considered to be below the poverty level. Poverty level thresholds are established by the US Census Bureau based on a set of income thresholds that vary by family size. Poverty thresholds do not vary geographically, but are updated annually for inflation. The poverty thresholds, by household size, in 2000, were as follows: one person $8,787; two persons $11,234; three persons $13,737; four persons $17,600; five persons $20,804. Table 3.3-4 represents the number of residents in the study area communities who had household incomes below the poverty level at the time of the 2000 census. Overall, 7.3 percent of the

Table 3.3-3
Median Household and *Per Capita* Income 1990-2000
Socio-Economic Study Area

	Household Income					*Per Capita* Income					
Strafford County	**1990**	**2000**	**% of County in 2000**	**Change 90-00**	**% Change 90-00**		**1990**	**2000**	**% of County in 2000**	**Change 90-00**	**% Change 90-00**
Barrington	$35,542	$50,630	113.0%	$15,088	42.5%	Barrington	$14,033	$21,012	102.6%	$6,979	49.7%
Dover	$31,507	$43,873	97.9%	$12,366	39.2%	Dover	$15,413	$23,459	114.6%	$8,046	52.2%
Durham	$42,477	$51,697	115.4%	$9,220	21.7%	Durham	$12,774	$17,210	84.0%	$4,436	34.7%
Farmington	$31,112	$40,971	91.4%	$9,859	31.7%	Farmington	$12,166	$16,574	80.9%	$4,408	36.2%
Lee	$43,421	$57,993	129.4%	$14,572	33.6%	Lee	$17,153	$23,905	116.7%	$6,752	39.4%
Madbury	$42,208	$57,981	129.4%	$15,773	37.4%	Madbury	$16,695	$26,524	129.5%	$9,829	58.9%
Middleton	$33,125	$43,942	98.1%	$10,817	32.7%	Middleton	$11,604	$18,415	89.9%	$6,811	58.7%
Milton	$32,888	$44,194	98.6%	$11,306	34.4%	Milton	$12,397	$18,092	88.3%	$5,695	45.9%
New Durham	$34,857	$52,270	116.7%	$17,413	50.0%	New Durham	$12,919	$22,139	108.1%	$9,220	71.4%
Rochester	$30,807	$40,596	90.6%	$9,789	31.8%	Rochester	$13,395	$18,859	92.1%	$5,464	40.8%
Rollinsford	$37,741	$48,588	108.4%	$10,847	28.7%	Rollinsford	$16,697	$24,444	119.4%	$7,747	46.4%
Somersworth	$32,886	$42,739	95.4%	$9,853	30.0%	Somersworth	$13,495	$19,592	95.7%	$6,097	45.2%
Strafford	$37,500	$52,270	116.7%	$14,770	39.4%	Strafford	$13,771	$22,139	108.1%	$8,368	60.8%
Rockingham County											
Brentwood	$43,654	$68,971	118.6%	$25,317	58.0%	Brentwood	$16,112	$22,027	82.6%	$5,915	36.7%
East Kingston	$43,654	$65,197	112.1%	$21,543	49.3%	East Kingston	$15,713	$28,844	108.2%	$13,131	83.6%
Epping	$36,860	$50,739	87.3%	$13,879	37.7%	Epping	$14,208	$21,109	79.2%	$6,901	48.6%
Exeter	$36,121	$49,618	85.3%	$13,497	37.4%	Exeter	$18,531	$27,105	101.7%	$8,574	46.3%
Greenland	$47,125	$62,172	106.9%	$15,047	31.9%	Greenland	$19,637	$31,270	117.3%	$11,633	59.2%
Hampton	$40,929	$54,419	93.6%	$13,490	33.0%	Hampton	$18,371	$29,878	112.1%	$11,507	62.6%
Hampton Falls	$55,682	$76,348	131.3%	$20,666	37.1%	Hampton Falls	$23,736	$35,060	131.5%	$11,324	47.7%
Kensington	$44,773	$67,344	115.8%	$22,571	50.4%	Kensington	$17,645	$29,265	109.8%	$11,620	65.9%
New Castle	$47,344	$83,708	144.0%	$36,364	76.8%	New Castle	$24,726	$67,695	254.0%	$42,969	173.8%
Newfields	$42,237	$71,375	122.7%	$29,138	69.0%	Newfields	$15,821	$28,687	107.6%	$12,866	81.3%
Newington	$41,607	$59,464	102.3%	$17,857	42.9%	Newington	$17,954	$30,172	113.2%	$12,218	68.1%

Table 3.3-3 (continued)

	Household Income					*Per Capita* Income					
Rockingham County (Con't)	**1990**	**2000**	**% of County in 2000**	**Change 90-00**	**% Change 90-00**		**1990**	**2000**	**% of County in 2000**	**Change 90-00**	**% Change 90-00**
Newmarket	$32,348	$46,058	79.2%	$13,710	42.4%	Newmarket	$15,078	$22,085	82.9%	$7,007	46.5%
North Hampton	$47,072	$66,696	114.7%	$19,624	41.7%	North Hampton	$23,672	$34,187	128.3%	$10,515	44.4%
Northwood	$31,768	$52,270	116.7%	$20,502	64.5%	Northwood	$12,562	$22,139	108.1%	$9,577	76.2%
Nottingham	$41,761	$52,270	116.7%	$10,509	25.2%	Nottingham	$15,708	$22,139	108.1%	$6,431	40.9%
Portsmouth	$30,591	$45,195	77.7%	$14,604	47.7%	Portsmouth	$15,557	$27,540	103.3%	$11,983	77.0%
Rye	$42,143	$63,152	108.6%	$21,009	49.9%	Rye	$28,020	$36,746	137.9%	$8,726	31.1%
Stratham	$51,567	$76,726	131.9%	$25,159	48.8%	Stratham	$23,104	$33,270	124.8%	$10,166	44.0%
Carroll County											
Brookfield	$39,653	$52,132	130.4%	$12,479	31.5%	Brookfield	$14,993	$25,745	117.4%	$10,752	71.7%
Wakefield	$28,171	$42,500	106.3%	$14,329	50.9%	Wakefield	$12,992	$21,507	98.1%	$8,515	65.5%
Carroll County	$28,145	$39,990		$11,845	42.1%	Carroll County	$14,041	$21,931		$7,890	56.2%
Rockingham County	$41,881	$58,150		$16,269	38.8%	Rockingham County	$17,694	$26,656		$8,962	50.6%
Strafford County	$32,812	$44,803		$11,991	36.5%	Strafford County	$13,999	$20,479		$6,480	46.3%
New Hampshire	$36,329	$49,467		$13,138	36.2%	New Hampshire	$15,959	$23,844		$7,885	49.4%

Source: US Census

Note: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

Table 3.3-4
Poverty Status by Age (2000)
Socio-Economic Study Area

		Below Poverty Level				% Below Poverty Level		
Strafford County	**Total Population***	**Under 5**	**5 to 18**	**65 and over**	**Total**	**Total**	**Under 5**	**65 and over**
Barrington	7,441	10	401	0	411	5.5%	0.1%	0.0%
Dover	26,079	154	1,856	183	2,193	8.4%	0.6%	0.7%
Durham	8,110	8	2,229	9	2,246	27.7%	0.1%	0.1%
Farmington	5,727	55	423	67	545	9.5%	1.0%	1.2%
Lee	4,114	23	171	17	211	5.1%	0.6%	0.4%
Madbury	1,501	7	76	4	87	5.8%	0.5%	0.3%
Middleton	1,433	16	79	9	104	7.3%	1.1%	0.6%
Milton	3,903	62	227	18	307	7.9%	1.6%	0.5%
New Durham	2,200	5	91	16	112	5.1%	0.2%	0.7%
Rochester	28,140	244	1,797	316	2,357	8.4%	0.9%	1.1%
Rollinsford	2,644	0	87	11	98	3.7%	0.0%	0.4%
Somersworth	11,334	130	743	122	995	8.8%	1.1%	1.1%
Strafford	3,620	8	8	15	31	0.9%	0.2%	0.4%
Rockingham County								
Brentwood	2,728	9	75	16	100	3.7%	0.3%	0.6%
East Kingston	1,769	4	73	0	77	4.4%	0.2%	0.0%
Epping	5,459	29	120	31	180	3.3%	0.5%	0.6%
Exeter	13,777	54	591	97	742	5.4%	0.4%	0.7%
Greenland	3,196	7	164	19	190	5.9%	0.2%	0.6%
Hampton	14,804	65	657	148	870	5.9%	0.4%	1.0%
Hampton Falls	1,875	0	47	8	55	2.9%	0.0%	0.4%
Kensington	1,875	8	71	8	87	4.6%	0.4%	0.4%
New Castle	999	0	6	0	6	0.6%	0.0%	0.0%
Newfields	1,546	6	38	0	44	2.8%	0.4%	0.0%
Newington	776	0	32	4	36	4.6%	0.0%	0.5%
Newmarket	8,019	43	589	37	669	8.3%	0.5%	0.5%
North Hampton	4,248	0	104	37	141	3.3%	0.0%	0.9%
Northwood	3,623	12	25	10	47	1.3%	0.3%	0.3%
Nottingham	3,674	0	17	6	23	0.6%	0.0%	0.2%
Portsmouth	20,244	138	1,490	255	1,883	9.3%	0.7%	1.3%
Rye	5,132	24	149	8	181	3.5%	0.5%	0.2%
Stratham	6,344	0	68	6	74	1.2%	0.0%	0.1%
Carroll County								
Brookfield	605	0	7	2	9	1.5%	0.0%	0.3%
Wakefield	4,203	18	243	37	298	7.1%	0.4%	0.9%
Study Area Total	**211,142**	**1,139**	**12,754**	**1,516**	**15,409**	**7.3%**	**0.5%**	**0.7%**

Source: US Census
* Population for whom poverty status is determined

study area's population, in 2000, was living below the poverty level. However, this average is skewed higher due to the large number of college students in Durham who responded to the census, but do not necessarily reside there on a year-round basis.

A more detailed perspective regarding households in poverty within the project area is presented in Table 3.3-5. The data in this table identifies the poverty rate of residents in Block Groups (BG) that comprise the project area in Dover and Newington, as well as the area in Portsmouth (that is not in the study area) that abuts the project area along Gosling Road. Overall, the project area had a poverty rate of 7.1 percent in 2000, as compared to 7.3 percent for the study area as a whole. However, two BGs in Portsmouth, 6941 and 6942, had poverty rates that were substantially higher than the study area at 13.3 percent and 28 percent respectively. Also higher, but to a lesser degree, was BG 6931 that had a poverty rate of 9.4 percent.

Several of these Block Groups are the location of subsidized housing for low-income residents, which contributes to the higher rates of poverty in those areas. In Portsmouth, off Gosling Road, is Gosling Meadows, a US

Department of Housing and Urban Development (HUD) supported housing project that contains 124 housing units occupied by low-income families. The project is fully occupied at this time and there are no plans for expansion.

The other subsidized housing in the project area is the Great Bay School, which is located on Woodbury Avenue in Newington. This facility provides vocational training for developmentally disabled individuals and operates a group residential home on the site, which contains 12 single occupancy rooms that are fully occupied. The facility also provides training for approximately 100 developmentally disabled individuals, who do not reside at the school.

3.3.3 Population Projections

This section presents an overview of population projections for the study area that were prepared by the NH Office of Energy and Planning (NHOEP) in March of 2003. The NHOEP's projections are the primary source of this type of data prepared by a governmental agency within New Hampshire for the purpose of estimating long-term growth trends. For comparison purposes, projections developed by Woods & Poole Economics, Inc. (W&P), a private data analysis firm, have also been included. The W&P projections are available at the county level only, whereas NHOEP's projections are available at both the county and municipal levels of geography. The W&P projections were prepared in 1998.

Table 3.3-5
Poverty Status by Age (2000)
Project Area Block Groups

Town	Block Group	Total	Below Poverty Level				% Below Poverty		
			Under 5	5 to 18	65 and over	Total	Total	Under 5	65 and over
Newington	6853	776	0	32	4	36	4.6%	0.0%	0.5%
Portsmouth	6931	978	0	67	25	92	9.4%	0.0%	2.6%
	6941	1,276	18	152	0	170	13.3%	1.4%	0.0%
	6942	835	40	190	4	234	28.0%	4.8%	0.5%
	6952	595	0	6	6	12	2.0%	0.0%	1.0%
	6953	36	0	0	0	0	0.0%	0.0%	0.0%
Dover	8112	3,747	0	85	18	103	2.7%	0.0%	0.5%
	8122	1,980	13	69	0	82	4.1%	0.7%	0.0%
Block Group Total		10,223	71	601	57	729	7.1%	0.7%	0.6%
Study Area Total		**200,225**	**1,139**	**12,754**	**1,516**	**15,409**	**7.3%**	**.5%**	**0.7%**

Source: US Census

The NHOEP projections are essentially based on the assumption that historical growth trends will remain approximately the same in the future. NHOEP first projects state level growth based on migration patterns and natural increases in the population. This statewide projection is then allocated down to the county and municipal levels based on historic absorption patterns and input obtained from regional planning agencies.

In contrast, the W&P projections are based on a national model that links population growth to expected economic conditions within all counties throughout the country. The W&P model represents an export-based approach to forecasting employment in a given region. Projected growth in regional export industries (*i.e.* manufacturing, mining, and agriculture) are used to estimate employment in non-export industries (*i.e.* retail, construction, transportation, and communications). Population growth is in turn projected based on the anticipated demand for employment within these economic sectors, as well as traditional cohort analysis of births and deaths.

Table 3.3-6 presents NHOEP population projections from 2000 to 2025 with intermediate estimates given for years 2010 and 2020. These projections suggest that the study area population will increase by 60,074 within this 25-year horizon. During the prior 30 years, the study area's population increased by approximately 78,100 (Table 3.3-1). The Strafford County portion of the study area's population is projected to increase by approximately 30,600 individuals during the planning period, while the

Table 3.3-6
Population Projections 2000-2025
Socio-Economic Study Area

	Actual	Projected Population			Change			% Change			Avg. Annual Change		
	2000	2010	2020	2025	00-10	10-20	00-25	00-10	10-20	00-25	00-10	10-20	00-25
Barrington	7,475	8,680	9,860	10,420	1,205	1,180	2,945	16.1%	13.6%	39.4%	2%	1%	1%
Dover	26,884	28,930	30,150	30,680	2,046	1,220	3,796	7.6%	4.2%	14.1%	1%	0%	1%
Durham	12,664	13,980	15,480	16,180	1,316	1,500	3,516	10.4%	10.7%	27.8%	1%	1%	1%
Farmington	5,774	6,650	7,500	7,890	876	850	2,116	15.2%	12.8%	36.6%	1%	1%	1%
Lee	4,145	4,730	5,360	5,660	585	630	1,515	14.1%	13.3%	36.6%	1%	1%	1%
Madbury	1,509	1,740	1,940	2,030	231	200	521	15.3%	11.5%	34.5%	1%	1%	1%
Middleton	1,440	1,710	1,980	2,110	270	270	670	18.8%	15.8%	46.5%	2%	1%	2%
Milton	3,910	4,550	5,170	5,470	640	620	1,560	16.4%	13.6%	39.9%	2%	1%	1%
New Durham	2,220	2,820	3,500	3,820	600	680	1,600	27.0%	24.1%	72.1%	2%	2%	2%
Rochester	28,461	31,630	35,070	36,690	3,169	3,440	8,229	11.1%	10.9%	28.9%	1%	1%	1%
Rollinsford	2,648	2,910	3,210	3,350	262	300	702	9.9%	10.3%	26.5%	1%	1%	1%
Somersworth	11,477	12,090	12,930	13,530	613	840	2,053	5.3%	6.9%	17.9%	1%	1%	1%
Strafford	3,626	4,220	4,770	5,040	594	550	1,414	16.4%	13.0%	39.0%	2%	1%	1%
Subtotal Strafford	**112,233**	**124,640**	**136,920**	**142,870**	**12,407**	**12,280**	**30,637**	**11.1%**	**9.9%**	**27.3%**	**1%**	**1%**	**1%**
Brentwood	3,197	3,710	4,040	4,190	513	330	993	16.0%	8.9%	31.1%	1%	1%	1%
East Kingston	1,784	2,060	2,310	2,430	276	250	646	15.5%	12.1%	36.2%	1%	1%	1%
Epping	5,476	6,210	6,660	6,860	734	450	1,384	13.4%	7.2%	25.3%	1%	1%	1%
Exeter	14,058	15,430	16,680	17,230	1,372	1,250	3,172	9.8%	8.1%	22.6%	1%	1%	1%
Greenland	3,208	3,700	4,180	4,380	492	480	1,172	15.3%	13.0%	36.5%	1%	1%	1%
Hampton	14,937	16,630	18,180	18,880	1,693	1,550	3,943	11.3%	9.3%	26.4%	1%	1%	1%
Hampton Falls	1,880	2,170	2,440	2,580	290	270	700	15.4%	12.4%	37.2%	1%	1%	1%
Kensington	1,893	2,180	2,470	2,570	287	290	677	15.2%	13.3%	35.8%	1%	1%	1%
New Castle	1,010	1,130	1,230	1,280	120	100	270	11.9%	8.8%	26.7%	1%	1%	1%
Newfields	1,551	1,750	1,910	1,980	199	160	429	12.8%	9.1%	27.7%	1%	1%	1%
Newington	775	870	950	990	95	80	215	12.3%	9.2%	27.7%	1%	1%	1%
Newmarket	8,027	8,910	9,530	9,810	883	620	1,783	11.0%	7.0%	22.2%	1%	1%	1%
North Hampton	4,259	4,870	5,310	5,510	611	440	1,251	14.3%	9.0%	29.4%	1%	1%	1%
Northwood	3,640	4,110	4,520	4,700	470	410	1,060	12.9%	10.0%	29.1%	1%	1%	1%

Table 3.3-6 (continued)

	Actual	Projected Population			Change			% Change			Avg. Annual Change		
	2000	2010	2020	2025	00-10	10-20	00-25	00-10	10-20	00-25	00-10	10-20	00-25
Nottingham	3,701	4,360	4,920	5,170	659	560	1,469	17.8%	12.8%	39.7%	2%	1%	1%
Portsmouth	20,784	22,210	24,380	25,390	1,426	2,170	4,606	6.9%	9.8%	22.2%	1%	1%	1%
Rye	5,182	5,750	6,150	6,330	568	400	1,148	11.0%	7.0%	22.2%	1%	1%	1%
Stratham	6,355	7,280	8,060	8,410	925	780	2,055	14.6%	10.7%	32.3%	1%	1%	1%
Subtotal Rockingham	**101,717**	**113,330**	**123,920**	**128,690**	**11,613**	**10,590**	**26,973**	**11.4%**	**9.3%**	**26.5%**	**1%**	**1%**	**1%**
Brookfield	604	760	910	960	156	150	356	25.8%	19.7%	58.9%	2%	2%	2%
Wakefield	4,252	5,110	6,020	6,360	858	910	2,108	20.2%	17.8%	49.6%	2%	2%	2%
Subtotal Carroll	**4,856**	**5,870**	**6,930**	**7,320**	**1,014**	**1,060**	**2,464**	**20.9%**	**18.1%**	**50.7%**	**2%**	**2%**	**2%**
Study Area Total	**218,806**	**243,840**	**267,770**	**278,880**	**25,034**	**23,930**	**60,074**	**11.4%**	**9.8%**	**27.5%**	**1%**	**1%**	**1%**

County Projections by NH Office of Energy and Planning

	Estimated	Projected Population			Change			% Change			Avg. Annual Change		
	2000	2010	2020	2025	00-10	10-20	00-25	00-10	10-20	00-25	00-10	10-20	00-25
Carroll County	43,666	51,260	59,000	61,850	7,594	7,740	18,184	17.4%	15.1%	41.6%	2%	1%	1%
Rockingham County	277,359	313,130	343,320	356,800	35,771	30,190	79,441	12.9%	9.6%	28.6%	1%	1%	1%
Strafford County	112,233	124,650	136,920	142,870	12,417	12,270	30,637	11.1%	9.8%	27.3%	1%	1%	1%
Total	**435,258**	**491,050**	**541,260**	**563,545**	**55,782**	**50,200**	**128,262**	**12.8%**	**10.2%**	**29.5%**	**1%**	**1%**	**1%**

County Projections by Woods & Poole Economics, Inc.

	Estimated	Projected Population			Change			% Change			Avg. Annual Change		
	2000	2010	2020	2025	00-10	10-20	00-25	00-10	10-20	00-25	00-10	10-20	00-25
Carroll County	40,720	46,140	51,650	54,460	5,420	5,510	13,740	13.3%	11.9%	33.7%	1%	1%	1%
Rockingham County	279,030	314,330	350,200	368,550	35,300	35,870	89,520	12.7%	11.4%	32.1%	1%	1%	1%
Strafford County	111,450	119,530	127,810	132,090	8,080	8,280	20,640	7.2%	6.9%	18.5%	1%	1%	1%
Total	**433,200**	**482,010**	**531,680**	**557,125**	**48,800**	**49,660**	**123,900**	**11.3%**	**10.3%**	**28.6%**	**1%**	**1%**	**1%**

Source: NH Office of State Planning 2003 and Woods & Poole Economics, Inc. 1998
Note: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

Rockingham portion is expected to experience a smaller increase of approximately 27,000 residents.

The growth rate of the study area is projected to be slightly higher in the first decade between 2000 and 2010 at 11.4 percent, followed by a slower rate of increase of 9.8 percent for the following ten years between 2010 and 2020. Overall, the study area's population is projected to grow at a rate of 27.5 percent within the 25-year planning period (2000-2025), a rate that is approximately half of the historical growth rate (55.5 percent from 1970-2000) for this area.

Due to the nature of the methodology used by NHOEP, towns and cities projected to absorb the largest amount of future growth are essentially the same ones that have historically done so. In Strafford County, these include Rochester, Dover, Farmington, Durham, Barrington, and Somersworth although the total projected increases in Dover and Barrington have been reduced considerably from previous growth levels. A similar scenario is true for the projected population of the Rockingham portion of the study area. One prominent change in this area involves the City of Portsmouth, where total population is projected to increase by approximately 4,600 by 2025. This level of increase is questionable given the limited amount of developable land remaining in the city coupled with the typically high cost of purchasing housing.

Also illustrated in Table 3.3-6 is a comparison of countywide projections prepared by NHOEP and W&P for Carroll, Rockingham and Strafford Counties. It should be noted that since the W&P projections were completed in 1998 they begin with a base year that is different from NHOEP's. Overall, both sets of projections arrive at comparable long-term growth levels for the combined total populations of all three counties, which are within a difference of less than 5,000 by 2025 (128,300 versus 123,900). However, there are considerable differences exhibited when examining the distribution of the projected growth within each county. NHOEP estimates that Rockingham's population change will be approximately 79,500 (2000-2025) versus an estimated increase of approximately 89,500 by W&P, a difference of 10,000. Conversely, W&P places Strafford County's population growth at approximately 10,000 less and Carroll County's at approximately 5,000 less than NHOEP's respective projections for 2025.

3.3.4 Housing Characteristics

Within the study area's overall housing growth there was a considerable difference between the number of units added to the supply during the 1980s and 1990s. As Table 3.3-7 indicates, approximately 21,000 units were added during the 1980s as compared with approximately 6,300 during the 1990s, a

Table 3.3-7
Change in Total Housing Units 1980-2000
Socio-Economic Study Area

	Total Units			Change			% Change			Avg. Annual Change		
	1980	1990	2000	80-90	90-00	80-00	80-90	90-00	80-00	80-90	90-00	80-00
Barrington	1,957	2,640	3,147	683	507	1,190	34.9%	19.2%	60.8%	3.0%	1.8%	2.4%
Dover	8,759	11,307	11,924	2,548	617	3,165	29.1%	5.5%	36.1%	2.6%	0.5%	1.6%
Durham	2,144	2,508	2,923	364	415	779	17.0%	16.5%	36.3%	1.6%	1.5%	1.6%
Farmington	1,800	2,260	2,337	460	77	537	25.6%	3.4%	29.8%	2.3%	0.3%	1.3%
Lee	906	1,393	1,534	487	141	628	53.8%	10.1%	69.3%	4.4%	1.0%	2.7%
Madbury	359	528	543	169	15	184	47.1%	2.8%	51.3%	3.9%	0.3%	2.1%
Middleton	508	654	706	146	52	198	28.7%	8.0%	39.0%	2.6%	0.8%	1.7%
Milton	1,177	1,767	1,815	590	48	638	50.1%	2.7%	54.2%	4.1%	0.3%	2.2%
New Durham	984	1,231	1,309	247	78	325	25.1%	6.3%	33.0%	2.3%	0.6%	1.4%
Rochester	8,153	11,076	11,836	2,923	760	3,683	35.9%	6.9%	45.2%	3.1%	0.7%	1.9%
Rollinsford	819	1,040	1,060	221	20	241	27.0%	1.9%	29.4%	2.4%	0.2%	1.3%
Somersworth	4,016	4,719	4,841	703	122	825	17.5%	2.6%	20.5%	1.6%	0.3%	0.9%
Strafford	667	1,266	1,564	599	298	897	89.8%	23.5%	134.5%	6.6%	2.1%	4.4%
Subtotal Strafford	**32,249**	**42,389**	**45,539**	**10,140**	**3,150**	**13,290**	**31.4%**	**7.4%**	**41.2%**	**2.8%**	**0.7%**	**1.7%**
Brentwood	590	778	920	188	142	330	31.9%	18.3%	55.9%	2.8%	1.7%	2.2%
East Kingston	390	494	648	104	154	258	26.7%	31.2%	66.2%	2.4%	2.8%	2.6%
Epping	1,343	2,059	2,215	716	156	872	53.3%	7.6%	64.9%	4.4%	0.7%	2.5%
Exeter	4,406	5,346	6,107	940	761	1,701	21.3%	14.2%	38.6%	2.0%	1.3%	1.6%
Greenland	734	1,082	1,244	348	162	510	47.4%	15.0%	69.5%	4.0%	1.4%	2.7%
Hampton	6,962	8,599	9,349	1,637	750	2,387	23.5%	8.7%	34.3%	2.1%	0.8%	1.5%
Hampton Falls	485	591	729	106	138	244	21.9%	23.4%	50.3%	2.0%	2.1%	2.1%
Kensington	456	585	672	129	87	216	28.3%	14.9%	47.4%	2.5%	1.4%	2.0%
New Castle	362	399	488	37	89	126	10.2%	22.3%	34.8%	1.0%	2.0%	1.5%
Newfields	281	324	532	43	208	251	15.3%	64.2%	89.3%	1.4%	5.1%	3.2%
Newington	273	320	305	47	-15	32	17.2%	-4.7%	11.7%	1.6%	-0.5%	0.6%
Newmarket	1,859	3,285	3,457	1,426	172	1,598	76.7%	5.2%	86.0%	5.9%	0.5%	3.2%
North Hampton	1,302	1,495	1,782	193	287	480	14.8%	19.2%	36.9%	1.4%	1.8%	1.6%
Northwood	874	1,791	1,905	917	114	1,031	104.9%	6.4%	118.0%	7.4%	0.6%	4.0%
Nottingham	712	1,314	1,592	602	278	880	84.6%	21.2%	123.6%	6.3%	1.9%	4.1%
Portsmouth*	9,880	11,369	10,186	1,489	-1,183	306	15.1%	-10.4%	3.1%	1.4%	-1.1%	0.2%
Rye	2,362	2,443	2,645	81	202	283	3.4%	8.3%	12.0%	0.3%	0.8%	0.6%
Stratham	848	1,917	2,371	1,069	454	1,523	126.1%	23.7%	179.6%	8.5%	2.1%	5.3%
Subtotal Rockingham	**34,119**	**44,191**	**47,147**	**10,072**	**2,956**	**13,028**	**29.5%**	**6.7%**	**38.2%**	**2.6%**	**0.6%**	**1.6%**
Brookfield	207	274	280	67	6	73	32.4%	2.2%	35.3%	2.8%	0.2%	1.5%
Wakefield	2,472	3,158	3,331	686	173	859	27.8%	5.5%	34.7%	2.5%	0.5%	1.5%
Subtotal Carroll	**2,679**	**3,432**	**3,611**	**753**	**179**	**932**	**28.1%**	**5.2%**	**34.8%**	**2.5%**	**0.5%**	**1.5%**
Study Area Total	**69,047**	**90,012**	**96,297**	**20,965**	**6,285**	**27,250**	**30.4%**	**7.0%**	**39.5%**	**2.7%**	**0.7%**	**1.7%**

Source: US Census

* The decline in Portsmouth's total housing units is primarily attributable to the closing of Pease Air Force Base

Note: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

decline of more than two-thirds within a ten-year period. There was an even greater decrease in the rate of growth over these two decades, which declined from 30.4 percent to 7 percent respectively. From an annual perspective, the rate of housing growth decreased from 2.7 percent during 1980s to 0.7 percent in the 1990s.

Total housing growth in the Strafford County portion of the socio-economic study area slightly exceeded that of the Rockingham County portion in both decades (see Table 3.3-7). Overall, Strafford area communities saw an increase of 13,290 units between 1980 and 2000, while Rockingham added 13,028 during that time. However, if the decrease of 1,183 in Portsmouth's housing supply (primarily due to the closing of Pease AFB) is eliminated, the above scenario is reversed, with Rockingham's growth slightly exceeding Strafford's (14,211 versus 13,290, respectively) over the 20-year period.

It is unlikely that the growth rates experienced during the 1970s and 1980s will be repeated again within the foreseeable future. This is due to several reasons: a diminishing land supply, changes in financial lending practices for housing construction, escalating costs of housing construction, considerable changes in land use regulations in study area towns since the boom growth of the 1980s, and the fact that more communities are taking a pro-active approach to manage growth, especially residential growth, and preserve open space.

Table 3.3-8 provides a more detailed breakdown of the study area's housing supply with regard to year-round and seasonal units, and occupancy. As the data indicates, approximately 70 percent of the study area's housing supply is comprised of single-family dwellings as compared to 30 percent that are multi-family. This split is equivalent for both the Strafford and Rockingham County portions of the study area.

Approximately 7,600 units of the total housing supply were classified as seasonal units, indicating that they are only occupied for a portion of the year. This represented approximately 8 percent of the total housing stock of the study area in 2000. The largest concentration of seasonal homes in the Rockingham portion of the study area are located in the seacoast town of Hampton, which had approximately 2,500 of these units. The other towns with a sizeable number of seasonal units are found in Rye, which also lies along the seacoast, as well as Northwood and Nottingham. In Carroll County, the town of Wakefield has over 1,600 seasonal housing units, which represent approximately 48 percent of the town's total housing supply. In Strafford County, notable concentrations of seasonal homes are found in the northern communities of Milton and New Durham, as well as the Town of Barrington in the central portion of the county.

Table 3.3-8
Summary of Housing Units, 2000 Census
Socio-Economic Study Area

	Total Units (Year-round and Seasonal)					Year-round Units				Seasonal Units	
	Total	Single-Family*	% Total	Multi-Family**	% Total	Total	Occupied	Vacant	Rate	Total	% Total
Barrington	3,147	2,922	92.9%	225	7.1%	2,833	2,756	77	2.7%	314	10.0%
Dover	11,924	6,278	52.7%	5,646	47.3%	11,827	11,573	254	2.1%	97	0.8%
Durham	2,923	1,866	63.8%	1,057	36.2%	2,907	2,882	25	0.9%	16	0.5%
Farmington	2,337	1,847	79.0%	490	21.0%	2,243	2,146	97	4.3%	94	4.0%
Lee	1,534	1,271	82.9%	263	17.1%	1,479	1,466	13	0.9%	55	3.6%
Madbury	543	469	86.4%	74	13.6%	541	534	7	1.3%	2	0.4%
Middleton	706	705	99.9%	2	0.3%	529	516	14	2.6%	177	25.1%
Milton	1,815	1,641	90.4%	174	9.6%	1,502	1,456	46	3.1%	313	17.2%
New Durham	1,309	1,290	98.5%	18	1.4%	840	817	22	2.6%	469	35.8%
Rochester	11,836	8,374	70.8%	3,462	29.2%	11,730	11,434	296	2.5%	106	0.9%
Rollinsford	1,060	729	68.8%	331	31.2%	1,054	1,033	21	2.0%	6	0.6%
Somersworth	4,841	2,795	57.7%	2,046	42.3%	4,832	4,687	145	3.0%	9	0.2%
Strafford	1,564	1,501	96.0%	63	4.0%	1,317	1,281	36	2.7%	247	15.8%
Subtotal Strafford	**45,539**	**31,688**	**69.6%**	**13,851**	**30.4%**	**43,634**	**42,581**	**1,053**	**2.4%**	**1,905**	**4.2%**
Brentwood	920	906	98.5%	14	1.5%	917	911	6	0.7%	3	0.3%
East Kingston	648	633	97.7%	15	2.3%	639	629	10	1.6%	9	1.4%
Epping	2,215	1,895	85.6%	320	14.4%	2,115	2,047	68	3.2%	100	4.5%
Exeter	6,107	3,995	65.4%	2,112	34.6%	6,029	5,898	131	2.2%	78	1.3%
Greenland	1,244	1,047	84.2%	198	15.9%	1,226	1,204	23	1.9%	18	1.4%
Hampton	9,349	6,051	64.7%	3,298	35.3%	6,807	6,465	342	5.0%	2,542	27.2%
Hampton Falls	729	707	97.0%	22	3.0%	720	704	16	2.2%	9	1.2%
Kensington	672	635	94.5%	36	5.4%	667	656	10	1.5%	5	0.7%
New Castle	488	456	93.4%	35	7.2%	456	444	15	3.3%	32	6.6%
Newfields	532	488	91.7%	44	8.3%	530	516	14	2.6%	2	0.4%
Newington	305	271	88.9%	33	10.8%	302	294	7	2.3%	3	1.0%
Newmarket	3,457	1,872	54.2%	1,585	45.8%	3,424	3,379	45	1.3%	33	1.0%
North Hampton	1,782	1,655	92.9%	127	7.1%	1,718	1,671	47	2.7%	64	3.6%
Northwood	1,905	1,750	91.9%	155	8.1%	1,416	1,347	69	4.9%	489	25.7%
Nottingham	1,592	1,557	97.8%	35	2.2%	1,338	1,331	7	0.5%	254	16.0%
Portsmouth	10,186	4,966	48.8%	5,217	51.2%	10,148	9,874	271	2.7%	38	0.4%
Rye	2,645	2,362	89.3%	283	10.7%	2,277	2,176	101	4.4%	368	13.9%
Stratham	2,371	2,000	84.4%	371	15.6%	2,352	2,306	46	2.0%	19	0.8%
Subtotal Rockingham	**47,147**	**33,246**	**70.5%**	**13,900**	**29.5%**	**43,081**	**41,852**	**1,228**	**2.9%**	**4,066**	**8.6%**
Brookfield	280	280	100.0%	0	0.0%	242	237	6	2.5%	38	13.6%
Wakefield	3,331	3,155	94.7%	175	5.3%	1,730	1,684	45	2.6%	1,601	48.1%
Subtotal Carroll	**3,611**	**3,435**	**95.1%**	**175**	**4.9%**	**1,972**	**1,921**	**51**	**2.6%**	**1,639**	**45.4%**
Study Area Total	**96,297**	**68,369**	**71.0%**	**27,926**	**29.0%**	**88,687**	**86,354**	**2,332**	**2.6%**	**7,610**	**7.9%**

Source: US Census
* Single-family includes detached and attached units, mobile homes and "other" units
** Multi-Family includes all non-owner occupied housing with two or more units per structure
Note: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

Identifying changes in the amount of seasonal housing within the study area is complicated by the fact that the Census Bureau has changed its definition of these units over time, as well as the fact that most communities do not typically track the construction of new seasonal units within the building permit process. A review of census estimates of seasonal housing units between 1980 and 2000 suggests that the total has decreased by approximately 1,100 units. Some of this decline is due to the definitional change that occurred during this time period. However, some of this change is also likely attributable to the conversion of seasonal to year-round units. The potential for this type of conversion to continue has ramifications for long-term planning of transportation facilities.

The final housing characteristic presented in Table 3.3-8 relates to the vacancy rate of housing within the study area. As of 2000, the vacancy rate for year-round units was 2.6 percent, which represents approximately 2,300 vacant units. This is a relatively low vacancy rate and is indicative of the "tightening" of the area housing market, which over the last few years has resulted in an increase in the sales price of homes as well as monthly rental costs, issues that are discussed in a subsequent section. Vacancy rates were relatively comparable for both the Strafford and Rockingham portions of the study areas at 2.4 percent and 2.9 percent respectively.

Tables 3.3-9 and 3.3-10 indicate that housing costs rose steadily throughout the socio-economic study area with home sales prices increasing annually by approximately 8 percent between 1992 and 2002. Strafford County consistently had lower average prices throughout the decade, in comparison to Rockingham County, although its rate of appreciation (119.6 percent) during this time exceeded Rockingham County (106.6 percent). This is an indication of the role that the Strafford housing market plays in offering more affordable housing.

3.3.5 Local Land Use

The composition of the existing land use (Tables 3.3-11 and 3.3-12) varies dramatically between the Newington and Dover portions of the study area. Newington's portion of the study area is heavily industrialized and also includes a substantial amount of commercial development, as well as a residential component. Conversely, Dover's existing land use within the study area is comprised almost entirely of residential development along with a few scattered commercial and office facilities. **Figure 3.3-1** shows land use zoning in both communities.

Table 3.3-9
Average Home Sales Prices 1992-2002
Rockingham, Strafford and Seacoast Areas *

	Strafford Area			Rockingham Area			Seacoast Area		
	Avg. Sale Price	Total Units	Avg. DOM	Avg. Sale Price	Total Units	Avg. DOM	Avg. Sale Price	Total Units	Avg. DOM
1992	$84,543	782	128	$116,639	534	126	$135,342	615	101
1993	$82,302	1,012	140	$117,665	748	143	$143,471	749	116
1994	$87,093	1,085	138	$112,533	906	131	$149,979	940	115
1995	$83,287	942	148	$114,962	855	147	$155,568	961	129
1996	$92,232	1,129	234	$127,014	1,328	163	$166,787	938	181
1997	$100,309	1,368	180	$133,946	1,501	254	$182,548	1,065	202
1998	$106,774	1,469	167	$147,217	2,017	162	$193,916	1,271	226
1999	$120,648	1,722	138	$163,313	1,940	142	$213,261	1,307	136
2000	$140,265	1,579	118	$188,096	1,794	129	$243,935	1,310	126
2001	$166,041	1,546	119	$209,932	1,823	121	$268,943	1,196	127
2002	$185,626	1,699	119	$240,937	1,836	126	$299,319	1,296	123
Change 92-02	$101,083			$124,298			$163,977		
% Change	119.6%			106.6%			121.2%		
Avg. Annual Change	8.2%			7.5%			8.3%		

Source: National Association of Realtors
DOM = Days on Market
*Strafford Area includes Barrington, Brookfield, Dover, Durham, Farmington, Lee, Madbury, Middleton, Milton, New Durham, Rochester, Rollinsford, Somersworth, Strafford, and Union.
Rockingham Area includes Atkinson, Brentwood, Danville, East Kingston, Epping, Exeter, Fremont, Hampstead, Kensington, Kingston, Newfields, Newton, Nottingham, Plaistow, Raymond, Sandown, South Hampton and Stratham.
Seacoast Area includes Greenland, Hampton, Hampton Falls, New Castle, Newington, Newmarket, North Hampton, Portsmouth, Rye, and Seabrook.

Table 3.3-10
Median Monthly Gross Rent 1993-2003
Socio-Economic Study Area and the Cities of Rochester and Portsmouth

Median Gross Rent - 2003						
# Bedrooms	Study Area	Carroll County	Strafford County	Rockingham County	City of Rochester	City of Portsmouth
0	$563	NA	$580	$555	NA	NA
1	$731	$556	$719	$776	$682	$842
2	$899	$729	$857	$1,009	$837	$1,071
3	$1,148	$929	$1,043	$1,280	$939	$1,280
4+	$1,430	NA	$1,304	NA	NA	NA
All	$844	$650	$789	$939	$771	$1,071
Change in Gross Rent for a Two-Bedroom Unit 1993-2003						
Rent 1993	$564	$532	$543	$631	$685	$584
Rent 2003	$899	$729	$857	$1,009	$837	$1,071
Change 93-03	$335	$197	$314	$378	$152	$487
% Change	59.4%	37.0%	57.8%	59.9%	22.2%	83.4%
Annual Change	4.8%	3.2%	4.7%	4.8%	2.0%	6.3%

Source: 2003 Residential Rental Cost Survey, NH Housing Finance Authority.

3.3.5.1 Newington

The Newington portion of the project area is bisected by the Spaulding Turnpike and bordered by the water bodies of the Piscataqua River and Little Bay. The land area on the east side of the Turnpike is zoned primarily for industrial, waterfront industrial, office, and commercial uses, but there is also a small residential zone for a pre-existing enclave of approximately 15 houses along Patterson Lane. Zoning on the west side of the Turnpike in the vicinity of Nimble Hill Road is primarily single-family residential, although a portion of the office zone extends into this area as well.

Given its location at the intersection of two major highways (Interstate 95 and the Spaulding Turnpike), as well as its proximity to a deep-water port on the Piscataqua River, the Newington portion of the project area has long been the focus of commercial and industrial development. The port area contains several large fuel-storage tank farms, an electrical power generating plant, as well as other major manufacturing and warehousing operations. Commercial uses include two regional shopping malls, as well as a substantial amount of freestanding retail and service establishments that include a number of national chain stores.

Existing land use on the west side of the Turnpike is predominantly residential, although there is also approximately 150,000 sq. ft. of light manufacturing, as well as a gas station/convenience store located in the office zone that extends a short distance along this side of the highway. Of the total 72 housing units in the Newington portion of the project area, 61 are single-family housing units and 11 are contained in multi-family dwellings of two to three family structures.

As illustrated in Table 3.3-11, there are 143 properties classified as non-residential in the Newington portion of the project area, including 26 vacant parcels. These properties have a total assessed value of approximately $457 million and contain over 2.7 million square feet of buildings.[44] Residential properties have an assessed value of approximately $11.3 million for a combined value of $468.6 million within the Newington portion of the project area. This represents approximately 84.6 percent of the town's total taxable valuation (which is approximately $553.7 million) as reported in the 2002 annual town report.

There are an estimated 114 acres of undeveloped land remaining in the commercial and industrial zoning areas within the Newington project area (see Table 3.3-11). The largest contiguous block of this undeveloped land is owned by Public Service Company of New Hampshire, which controls approximately

▼

44 This building square footage understates the total non-residential building area since information regarding several of the larger industrial facilities was not available in town records.

82 acres. Available mapping of this land indicates that although a portion of this site is constrained by wetlands, there appears to be sufficient upland to construct approximately an additional 100,000 square feet. The remaining 32 acres of undeveloped land are scattered in smaller parcels that probably do not have potential for substantial future development. On the west side of the Turnpike there is an undeveloped parcel, approximately 16 acres in size, that was formerly used as a drive-in theater.

Based on discussions with the town planner in Newington, there are no anticipated plans for major economic initiatives or rezoning within this portion of the project area. The town has recently begun the process of updating its master plan, which was last revised in 1990. The town did recently coordinate the extension of Shattuck Way, which runs parallel to Woodbury Avenue and which was intended to remove industrial traffic from that roadway. Shattuck Way presently extends from the Exit 4 interchange to Piscataqua Drive. The town has planned for a future southern extension of this roadway from Piscataqua Drive to Gosling Road, which follows the town line between Newington and Portsmouth.

Table 3.3-11
Property Inventory - Town of Newington Study Area*

				Residential		
				Assessed Value		
Type of Property	# Properties	# Units	Acreage	Land	Building	Total
Single Family	61	61	127	$5,064,604	$4,873,255	$9,937,859
2-3 Family	5	11	5	$366,830	$468,300	$835,130
Vacant*	8	0	108	$464,582	$46,100	$510,682
Total	**74**	**72**	**240**	**$5,896,016**	**$5,387,655**	**$11,283,671**
				Non-Residential		
				Assessed Value		
Type of Property	# Properties	Bldg. Sq. Ft.	Acreage	Land	Building	Total
Retail/Service	20	1,741,547	203	$36,264,391	$89,211,841	$125,476,232
Restaurant/Lodging	5	56,789	17	$3,324,368	$2,797,880	$6,122,248
Office	4	67,941	16	$2,774,489	$3,435,794	$6,210,283
Warehouse	8	248,219	27	$3,329,147	$7,958,303	$11,287,450
Industrial**	76	558,723	234	$41,516,619	$249,983,502	$291,500,121
Other Commercial	2	29,888	9	$584,138	$1,632,991	$2,217,129
Institutional	2	65,898	34	$1,888,128	$1,495,033	$3,383,161
Vacant	26	0	114	$11,114,188	$0	$11,114,188
Total	**143**	**2,769,005**	**654**	**$100,795,468**	**$356,515,344**	**$457,310,812**

Source: Town of Newington assessment records, September 2003
* There is some building value on vacant land due to several properties that have minor structures/improvements but no residences.
** The building square footage of industrial structures does not contain several of the larger power plant and manufacturing facilities because this information is not available.

3.3.5.2 Dover

Existing land use patterns in the Dover portion of the project area represent a stark contrast to that which exists in Newington. Dover's land area is also bisected by the Spaulding Turnpike and bordered by the Piscataqua River and Little Bay. However, with the exception of a few non-residential developments, existing land use within the area is comprised entirely of residential dwellings.

Zoning within the area allows for both single and multi-family dwellings. There is also a small business zone that lies west of the Turnpike along Dover Point Road, which encompasses several of the existing commercial establishments in the area. Businesses in the area include a restaurant, Division of Motor Vehicles (DMV) building, two home furnishing stores, two small marinas, and two service organizations. There is also a state park (Hilton Park) at the tip of Dover Point and some conservation land (Bayview Park), which is managed by the NH Fish & Game Department.

Table 3.3-12 provides a summary of existing land uses within the Dover portion of the project area. As the data illustrates, there are 483 residential properties containing 629 dwelling units. Approximately 75 percent (462) of these units are single-family dwellings but a notable percentage (21percent, or 130 units) are condominiums. Almost all of the condominium units are contained in a single development located on Spur Road, at the intersection of US 4 and the Spaulding Turnpike. There are 18 mobile homes in the project area, almost all of which are located in a small mobile home park, which is adjacent to the west side of the Turnpike but accessed *via* Boston Harbor Road. As shown in the table, there is only 25 acres remaining of undeveloped land, based on information contained in the city's assessment records. The assessed value of residential land and buildings in the Dover portion of the project area is approximately $76.8 million. Non-residential development has an assessed value of approximately $6.3 million; however, almost half of that amount ($3.1 million) is non-taxable since it is in public ownership. Therefore, the combined assessed value of taxable property in the project area is approximately $79.9 million, which represents 4.3 percent of the city's $1.85 billion in net assessed value as of 2003.

3.3.6 Commuting Patterns

A review of journey-to-work commuting data (Tables 3.3-13 and 3.3-14) shows that approximately 76 percent (82,699) of all workers living in the socio-economic study area are also employed at businesses located within the socio-economic study area. This indicates there is a strong internal movement of socio-economic study area residents to employment activities located within the socio-economic study area. In Strafford County, the number of residents working

outside the county increased by approximately 20 percent between 1990 and 2000. The largest portion of this increase represented workers going to Rockingham County, which received approximately 65 percent of all outbound commuters from Strafford County as of 2000. There was a decrease in the number of Strafford County residents commuting to Maine during the decade, which may be attributable to the reduction in workforce at the Portsmouth Naval Shipyard in Kittery, Maine.

The Portsmouth-Rochester Metropolitan area has become much more integrated from an economic perspective, particularly within the last 10 years. Commuting patterns show that over three quarters of all people living in the metropolitan

Table 3.3-12
Property Inventory - City of Dover Study Area

Residential						
				Assessed Value		
Type of Property	# Properties	# Units	Acreage	Land	Building	Total
Single Family	462	462	159	$27,432,000	$27,088,100	$54,520,100
Mobile Homes	2	18	2	$232,900	$656,200	$889,100
Condominiums	3	130	35	$6,311,500	$11,849,300	$18,160,800
2-3 Family	5	11	4	$605,400	$649,800	$1,255,200
4 Family	2	8	2	$448,700	$415,100	$863,800
Vacant	9	0	22	$1,061,800	$0	$1,061,800
Total	**483**	**629**	**224**	**$36,092,300**	**$40,658,500**	**$76,750,800**
Non-Residential						
				Assessed Value		
Type of Property	# Properties	Bldg. Sq. Ft.	Acreage	Land	Building	Total
Retail/Service	2	15,597	2	$369,400	$532,800	$902,200
Restaurant/Lodging	1	871	1	$337,900	$962,000	$1,299,900
Office	2	4,579	1	$135,900	$158,700	$294,600
Other Commercial	2	7,796	2	$433,500	$157,300	$590,800
Municipal	3	960	4	$312,700	$148,700	$461,400
State	5	2,556	35	$2,330,900	$341,100	$2,672,000
Vacant	3	0	3	$94,400	$0	$94,400
Total	**18**	**32,359**	**48**	**$4,014,700**	**$2,300,600**	**$6,315,300**

Source: City of Dover Assessment Records - 2003

study area also work within the area. This transportation linkage is especially prevalent amongst residents of Strafford County, many of whom commute south to jobs located in Rockingham County. While this trend is also true for residents of the Rockingham County portion of the metropolitan area, there is a somewhat higher percentage of people living in Rockingham County that commute outside the socio-economic study area to employment locations in Massachusetts and elsewhere in New Hampshire.

Two major factors have helped to shape the commuting patterns mentioned above. The first is that a substantial portion of the business and job growth in the metropolitan study area has occurred within Rockingham County. This observation is illustrated by the closure of the Pease Air Force Base and its

redevelopment as the Pease International Tradeport in Portsmouth/ Newington, where the number of jobs created since 1990 account for approximately 20 percent of the net job growth over the last decade within the socio-economic study area. Combined with this higher job growth in the southern tier is a commensurate increase in the cost of housing. Housing costs in Rockingham County have remained consistently higher than those in Strafford and Carroll Counties over the last decade. This fact has attracted sustained residential growth to the northern portion of the socio-economic study area, which has supported an expanding workforce of commuters who require access to the regional transportation system.

3.3.7 Environmental Justice

In accordance with Executive Order 12898 and subsequent procedures developed by the US Department of Transportation, activities that have the potential to generate a disproportionately high and adverse effect on human health or the environment shall include explicit consideration of their effects on minority, elderly and low-income populations. In making an assessment of whether or not Environmental Justice has been served, information regarding race, color or national origin, and income level is obtained where relevant, appropriate and practical. Specific consideration is given to those populations that are most directly served or affected by the proposed action.

In order to evaluate potential Environmental Justice impacts of the Project Alternatives, 2000 Census data has been collected at the Block Group (BG) level for the portion of the study area in Dover, Newington, and Portsmouth that have the potential to be directly impacted by transportation system improvements. There are eight Block Groups for which data was gathered to examine potential disproportionate impacts on areas of racial minorities and low-income individuals. Overall, these eight BGs had an average minority population of 3.8 percent which was slightly higher that the study area's 3.4 percent average. From an income perspective, the eight BGs had an average poverty rate of 7.1 percent in 2000 as compared to 7.3 percent for the study area as a whole.

Several of these Block Groups include subsidized housing for low-income residents, which contributes to the higher rates of poverty in those areas. In Portsmouth, off Gosling Road, is Gosling Meadows, a HUD-supported housing project, which contains 124 housing units occupied by low-income families. The project, which is adjacent to the study area, is fully occupied at this time and there are no plans for expansion.

The other subsidized housing in the study area is the Great Bay School, which is located on Woodbury Avenue in Newington. This facility provides vocational training for developmentally disabled individuals, and operates a group residential home on the site, which contains 12 single occupancy

rooms that are fully occupied. The facility also provides training for approximately 100 developmentally-disabled individuals, who do not reside at the school.

Table 3.3-13
Place of Work for Workers 16 Years and Over – 2000, Socio-Economic Study Area

Place of Residence	Worked in Study Area	Worked Outside Study Area	Total	% Total In Study Area	% Total Outside Study Area
Barrington	3,370	822	4,192	80.4%	19.6%
Dover	12,422	2,600	15,022	82.7%	17.3%
Durham	4,928	930	5,858	84.1%	15.9%
Farmington	2,257	484	2,741	82.3%	17.7%
Lee	1,730	609	2,339	74.0%	26.0%
Madbury	687	116	803	85.6%	14.4%
Middleton	548	202	750	73.1%	26.9%
Milton	1,625	320	1,945	83.5%	16.5%
New Durham	782	377	1,159	67.5%	32.5%
Rochester	12,571	1,890	14,461	86.9%	13.1%
Rollinsford	1,179	302	1,481	79.6%	20.4%
Somersworth	4,733	988	5,721	82.7%	17.3%
Subtotal Strafford	**46,832**	**9,640**	**56,472**	**82.9%**	**17.1%**
Brentwood	815	577	1,392	58.5%	41.5%
East Kingston	407	554	961	42.4%	57.6%
Epping	1,964	1,074	3,038	64.6%	35.4%
Exeter	5,000	2,322	7,322	68.3%	31.7%
Greenland	1,391	307	1,698	81.9%	18.1%
Hampton	4,504	3,282	7,786	57.8%	42.2%
Hampton Falls	515	464	979	52.6%	47.4%
Kensington	461	552	1,013	45.5%	54.5%
New Castle	339	113	452	75.0%	25.0%
Newfields	573	231	804	71.3%	28.7%
Newington	339	122	461	73.5%	26.5%
Newmarket	3,729	1,204	4,933	75.6%	24.4%
North Hampton	1,628	632	2,260	72.0%	28.0%
Portsmouth	8,908	2,869	11,777	75.6%	24.4%
Rye	1,584	732	2,316	68.4%	31.6%
Stratham	2,253	867	3,120	72.2%	27.8%
Subtotal Rockingham	**34,410**	**15,902**	**50,312**	**68.4%**	**31.6%**
Brookfield	162	131	293	55.3%	44.7%
Wakefield	1,295	695	1,990	65.1%	34.9%
Subtotal Carroll	**1,457**	**826**	**2,283**	**63.8%**	**36.2%**
Study Area Total	**82,699**	**26,368**	**109,067**	**75.8%**	**24.2%**

Source: US Census

NOTE: Towns listed within Rockingham and Carroll counties are only those within the socio-economic study area. All municipalities within Strafford County are within the socio-economic study area.

Table 3.3-14
Change in County-to-County Commuting Patterns, 1990 and 2000
Strafford, Rockingham and Carroll Counties

Residents Commuting From: Strafford County	1990	2000	% Total	Change	% Change	Commuting to Jobs In: Strafford County	1990	2000	% Total	Change	% Change
Residents Working in County	32,488	34,364	59%	1,876	5.8%	Residents Working in County	32,488	34,364	74%	1,876	5.8%
Residents Commuting Out	20,047	24,039	41%	3,992	19.9%	Nonresidents Commuting In	10,781	12,125	26%	1,344	12.5%
Total	52,535	58,403	100%	5,868	11.2%	Total	43,269	46,489	100%	3,220	7.4%
Commuting To:						**Commuting From:**					
Belknap County	205	371	2%	166	81.0%	Belknap County	463	460	4%	-3	-0.6%
Carroll County	325	376	2%	51	15.7%	Carroll County	581	1,125	9%	544	93.6%
Hillsborough County	870	1,146	5%	276	31.7%	Hillsborough County	235	496	4%	261	111.1%
Merrimack County	671	1,193	5%	522	77.8%	Merrimack County	309	507	4%	198	64.1%
Rockingham County	11,343	15,537	65%	4,194	37.0%	Rockingham County	4,060	4,254	35%	194	4.8%
Other New Hampshire	153	110	0%	-43	-28.1%	Other New Hampshire	108	86	1%	-22	-20.4%
Maine	4,421	2,825	12%	-1,596	-36.1%	Maine	4,440	4,467	37%	27	0.6%
Massachusetts	1,578	2,104	9%	526	33.3%	Massachusetts	455	511	4%	56	12.3%
Other Outside NH	481	377	2%	-104	-21.6%	Other Outside NH	130	219	2%	89	68.5%
Rockingham County						**Rockingham County**					
Residents Working in County	67,438	78,659	53%	11,221	16.6%	Residents Working in County	67,438	78,659	61%	11,221	16.6%
Residents Commuting Out	64,087	70,044	47%	5,957	9.3%	Nonresidents Commuting In	33,539	49,402	39%	15,863	47.3%
Total	131,525	148,703	100%	17,178	13.1%	Total	100,977	128,061	100%	27,084	26.8%
Commuting To:						**Commuting From:**					
Belknap County	163	137	0%	-26	-16.0%	Belknap County	372	511	1%	139	37.4%
Carroll County	34	155	0%	121	355.9%	Carroll County	170	458	1%	288	169.4%
Hillsborough County	13,088	16,816	24%	3,728	28.5%	Hillsborough County	6,326	11,259	23%	4,933	78.0%
Merrimack County	2,277	3,753	5%	1,476	64.8%	Merrimack County	1,254	2,496	5%	1,242	99.0%
Strafford County	4,060	4,254	6%	194	4.8%	Strafford County	11,343	15,537	31%	4,194	37.0%
Other New Hampshire	237	235	0%	-2	-0.8%	Other New Hampshire	171	190	0%	19	11.1%
Maine	2,689	1,713	2%	-976	-36.3%	Maine	5,844	7,728	16%	1,884	32.2%
Massachusetts	40,179	41,689	60%	1,510	3.8%	Massachusetts	7,575	10,500	21%	2,925	38.6%
Other Outside NH	1,360	1,292	2%	-68	-5.0%	Other Outside NH	484	723	1%	239	49.4%

Table 3.3-14 (continued)

Residents Commuting From: Carroll County						Commuting to Jobs In: Carroll County					
	1990	2000	% Total	Change	% Change		1990	2000	% Total	Change	% Change
Residents Working in County	13,446	15,816	76%	2,370	17.6%	Residents Working in County	13,446	15,816	82%	2,370	17.6%
Residents Commuting Out	3,153	4,969	24%	1,816	57.6%	Nonresidents Commuting In	2,661	3,508	18%	847	31.8%
Total	16,599	20,785	100%	4,186	25.2%	Total	16,107	19,324	100%	3,217	20.0%
Commuting To:						**Commuting From:**					
Belknap County	839	1,239	25%	400	47.7%	Belknap County	414	581	17%	167	40.3%
Coos County	188	172	3%	-16	-8.5%	Coos County	193	303	9%	110	57.0%
Merrimack County	201	240	5%	39	19.4%	Merrimack County	62	99	3%	37	59.7%
Rockingham County	170	458	9%	288	169.4%	Rockingham County	34	155	4%	121	355.9%
Strafford County	581	1,125	23%	544	93.6%	Strafford County	325	376	11%	51	15.7%
Other New Hampshire	226	349	7%	123	54.4%	Other New Hampshire	123	221	6%	98	79.7%
Maine	431	422	8%	-9	-2.1%	Maine	1,340	1,644	47%	304	22.7%
Massachusetts	404	636	13%	232	57.4%	Massachusetts	106	75	2%	-31	-29.2%
Other Outside NH	113	328	7%	215	190.3%	Other Outside NH	64	54	2%	-10	-15.6%

Source: US Census

Section 4.3 Socio-Economic Excerpts

4.3 Socio-Economic Resources

This section examines impacts relating to proposed improvements identified for the Spaulding Turnpike on social and economic resources within the study area (**Figure 1.2-2**). The analysis evaluates possible impacts within three different categories that are briefly defined below.[64]

- **Direct effects** are caused by the action and occur at the same time and place.

- **Indirect effects** are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

- **Cumulative impacts** are the impacts on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result

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64 The following descriptive definitions are based on a Memorandum titled "Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process." (Federal Highway Administration, January 31, 2003).

from individually minor but collectively substantial actions taking place over a period of time.

In addition to an evaluation of possible direct, indirect and cumulative impacts, this section also contains a brief summary of major findings relating to social and economic trends in the identified socio-economic study area. This summary is included in order to provide supporting information and context for examining possible indirect and cumulative impacts.

4.3.1 Social and Economic Trends

It has been widely acknowledged that large projects, such as roadway improvements, can influence both regional and local development patterns. However, the type and intensity of future developments is also strongly linked to existing social and economic trends. The socio-economic study area (**Figure 1.3-1**) for this project has both regional and local components. The broader regional study area includes 33 municipalities within Strafford, Carroll and Rockingham Counties in the southeast portion of New Hampshire. It should be noted that although two communities, Brookfield and Wakefield, were not directly included in the analysis prepared with the economic model (REMI), both communities would most likely be impacted in a manner similar to communities in northern Strafford County, which were included in the analysis. The more localized project area includes portions of the Town of Newington and the City of Dover that border the 3.5-mile section of the Spaulding Turnpike being evaluated for upgrading. An examination of the economic and social trends in the regional study area indicates that key structural relationships, especially between Strafford and Rockingham Counties, have changed substantially during the past 20 to 30 years. Key trends that will provide a foundation for future growth patterns in the study area are briefly outlined below.

- The regional study area has experienced substantial growth over the past 20 to 30 years. However, the rate of growth over the most recent decade, between 1990 and 2000, was considerably slower than in the two previous decades (1970-1990). In addition, population growth in Strafford County consistently exceeded that of the Rockingham County portion of the study area for all three decades examined. Rockingham County as a whole, however, grew somewhat faster than Strafford County.

- It is unlikely that the growth rates experienced during the 1970s and 1980s will be repeated within the foreseeable future for several reasons. The first is due to a diminishing land supply and escalating costs of housing construction. The second is that considerable changes have been made to land use regulations in the study area communities since the boom growth of the 1980s, as well as the fact that many communities are now taking a more pro-active approach to managing growth and preserving open space.

- Based on New Hampshire Office of Energy and Planning projections, population within the study area is expected to increase by approximately 60,000 between 2000 and 2025, representing a growth of 27 percent (average annual growth rate of 0.95 percent). In comparison, the study area's population increased by approximately 78,000 between 1970 and 2000, a 55 percent increase (average annual growth rate of 1.5 percent).

- The average household size has declined within almost all communities in the study area over the last decade. Consequently, the projected decline in the rate of population growth for the study area will not necessarily result in a corresponding decrease in the number of new households and new housing units created within the study area in the future.

- The study area has a relatively small percentage of minority and economically disadvantaged residents. Based on Census 2000 data, less than 4 percent of all residents are characterized as being in the racial minority and 7.3 percent are living below the poverty income threshold.

- Approximately 27,250 dwelling units were added to the study area's housing supply over the past 20 years. This represents a total increase of 39.5 percent, or an average annual growth rate of 1.6 percent. Total housing growth in the Rockingham County portion of the study area was somewhat higher than that of the Strafford County portion (14,211 versus 13,290, respectively) if the decrease of 1,183 dwelling units in Portsmouth's housing supply, caused primarily by the closing of Pease AFB, is not considered.

- Residential construction trends in the study area have fluctuated substantially over the last 15 to 20 years. Overall, building permits for 25,272 residential dwellings were issued between 1985 and 2002, representing an annual average of approximately 1,400. Total permits issued went from a high of 3,752 in 1986 to a low of 579 in 1991. As of 2002, the number of permits issued (1,576) had returned to approximately half the number issued annually during the boom growth of the late 1980s.

- Housing costs rose steadily throughout the study area with home sale prices increasing annually by approximately 8 percent between 1992 and 2002. The Strafford area consistently had lower average prices throughout the decade, in comparison to the Rockingham area, although its rate of appreciation (119 percent) during this time period exceeded Rockingham's (106 percent). This is an indication of the substantial role that the Strafford housing market plays in offering more affordable housing in contrast to the higher priced homes available in the Rockingham portion of the study area.

- There has been considerable fluctuation in the area's labor force and unemployment rate over the last decade due to changing economic conditions at both the regional and national levels. At the beginning of the 1990s, the recession

resulted in the highest unemployment rates of the decade at 7 percent as well as a corresponding decline in the total labor force, which decreased by approximately 5,000 during the first part of the decade. Through the middle part of the 1990s, the economy began to rebound, which resulted in a sharp drop in the unemployment rate. As the unemployment rate began to drop, the area's labor force also started to recoup some of the losses incurred at the beginning of the decade. By 2002, the total labor force exceeded the 1990 level by approximately 7,000.

- Total employment within the study area, as of 2001, was approximately 106,900. Employment increased by 26 percent between 1993 and 2001, slightly exceeding the State of New Hampshire's 24 percent growth. During this time period, total private sector employment increased by approximately 21,000, or almost 30 percent, while government sector employment increased by approximately 1,500, or 11 percent. The redevelopment of the Pease International Tradeport has played a substantial role in the area's employment growth. Since the facility was converted to civilian use in the early 1990s, approximately 4,900 jobs have been created there, roughly equivalent to 20 percent of the total increase that occurred within the study area over the decade.

- The number of private sector establishments in the study area experienced a net increase of approximately 1,270 between 1993 and 2001. This represents a growth of 24 percent, which is somewhat less than the rate of employment growth. This suggests that a shift toward slightly larger firms (in terms of total number of employees) occurred within the study area over the last decade, although this increase would be relatively modest. Notable changes occurred in the services sector, which experienced a net gain of approximately 19,360 jobs over the course of the decade; a 97 percent increase. Conversely, the retail sector experienced the largest decline in total employment with a net loss of approximately 3,270, a decrease of 17 percent, which eliminated gains that had been recorded toward the end of the 1990s. The manufacturing sector lost employment as well, albeit at a lesser rate (668 jobs, or a 4.2 percent decrease), despite also having experienced gains during the previous decade.

- Vacancy rates in the office and industrial building markets within the study area are relatively high. As of 2002, vacancy rates were estimated to be 15 percent for office properties and 12 percent for industrial facilities. Retail properties, however, appear to be in better condition with an estimated vacancy rate of about 7 percent. At the Pease International Tradeport alone, vacancies for office and industrial facilities were even higher with respective rates of 20 percent and 31 percent. These higher vacancies are largely attributable to the downsizing that occurred in the high-tech industrial sector. Despite the high vacancies at the Tradeport, there is presently 278,000 square feet of space under construction and another 436,500 square feet approved for future construction. The facility presently has approximately 2.6 million square feet of existing building space.

- A review of journey-to-work commuting data shows that approximately 74 percent (85,221) of all workers living in the study area are also employed at businesses located within the study area. This indicates that there is a strong internal movement of residents related to employment occurring within the study area.

- In Strafford County, the number of residents working outside the County increased by approximately 20 percent between 1990 and 2000. The largest portion of this increase represented workers going to Rockingham County, which received approximately 65 percent of all outbound commuters from Strafford County as of 2000. There was a decrease in the number of Strafford County residents commuting to Maine during the decade, which may be attributable to a reduction in workforce at the Portsmouth Naval Shipyard in Kittery, Maine.

- Rockingham County had a larger percentage of residents (47 percent) commuting outside the county in 2000 than did Strafford County (39 percent). Of the total residents commuting outbound, the largest percentages traveled to Hillsborough County (24 percent) and the State of Massachusetts (59 percent). Only 6 percent (4,254) of those commuting outside the county for work had Strafford County as a destination. Although this data represents the whole of Rockingham County, and not just the portion of the County in the study area, it still provides a level of magnitude concerning the directional flow of commuters residing in the County.

4.3.2 Direct Effects

4.3.2.1 Property Acquisition

This section identifies the type and location of properties that may need to be acquired or relocated as a result of each of the Build Alternatives. These estimates are considered to represent a determination of potential acquisitions and relocations that may ultimately change following input at the Public Hearing and once final engineering design for the project has been completed and a required right-of-way layout has been approved.

Overall, the assessment of project alternatives indicates that only two to three properties (*i.e.* residences or businesses) may need to be acquired, depending on the combination of project alternatives selected (see Table 4.3-1). Along with specific properties identified for acquisition, partial takings of land necessitated by slope impacts have also been estimated. These estimates may also be revised once a final right-of-way boundary has been determined following input from the Public Hearing.

Alternative 10A

The construction of Alternative 10A is expected to result in the acquisition of a single residential property located on Shattuck Way in Newington. According to municipal assessment records, this residence is a duplex structure on 0.4 acres of land. No businesses are expected to be acquired or relocated as a result of this alternative. It is also anticipated that this alternative will require partial land acquisitions for new or widened rights-of-way that will total approximately 41 acres, which includes roughly 29 acres of land located within the Pease International Tradeport with the remaining 12 acres being privately owned.

Alternative 12A

This alternative will not require the acquisition or relocation of any residences or businesses. Partial land acquisitions due to new right-of-way construction, or widening of existing corridors, are estimated at about 43 acres. Approximately 29 acres of this total acquisition is located at the Pease International Tradeport, with an estimated 14 acres of privately owned property.

Alternative 13

This alternative will not require the acquisition or relocation of any residences or businesses. Land impacts from Alternative 13 will require the acquisition of approximately 42 acres, 36 of which are located within the Pease Tradeport with the remaining six acres being privately owned land.

Alternative 2

The construction of Alternative 2 is expected to necessitate the acquisition of two Dover businesses located in the commercial district on Dover Point Road. One of the businesses is a retail establishment and one is a service business (dog daycare) that is a home-based establishment, which includes a single family home, barn and yard space for kennels. The acquisition of only the barn and a portion of the lot are anticipated at this time. Both businesses are located on parcels of approximately 1¼ acre in size. Additional partial land acquisitions of approximately one acre may be necessary for roadway slope impacts at various locations.

Alternative 3

Property acquisitions for this alternative are expected to be the same as those identified for Alternative 2. Partial land acquisitions of approximately 1.5 acres may also be necessary for slope impacts related to roadway construction.

Table 4.3-1
Estimated Property Acquisitions and Municipal Tax Impacts[1]

	Roadway Alternatives					Bridge Alternatives Widen West	
	Newington			Dover			
	Alt 10A	Alt 12A	Alt 13	Alt 2	Alt 3	Rehab GSB	Remove GSB
Property Acquisition							
Structures							
Residential	1	0	0	0	0	0	0
Businesses	0	0	0	2	2	0	0
Land (Acres)							
Full Parcels	0.4	0	0	2.5	2.5	0	0
Partial Parcels[2]	41	43	42	1	1.5	0	0
Total acres	41.4	43	42	3.5	4.0	0	0
Municipal Tax Impacts							
Removed Taxable Value							
Buildings	$52,700	$0	$0	$366,800	$366,800	$0	$0
Land	$2,021,930	$2,240,000	$960,000	$745,900	$830,900	$0	$0
Total	$2,074,630	$2,240,000	$960,000	$1,112,700	$1,197,700	$0	$0
Estimated Reduction in Municipal Tax Revenues	$19,336[3]	$20,877[3]	$8,951[3]	$20,229[4]	$21,774[4]	$0	$0

Notes:
1 Data is from Assessor's Records 2004, Dover and Newington; VHB, Inc.; and RKG Associates, Inc.
2 The acreages reported in this table are based on preliminary estimates of the property acquisitions. The majority of the estimated partial takings involve land at the Pease Tradeport which is tax exempt and therefore, results in no reduction in municipal tax revenues.
3 The total 2004 municipal tax revenue commitment to the Town of Newington was $6.1 million on a total valuation of $781 million.
4 The total 2004 municipal tax revenue commitment to the City of Dover was $43.7 million on a total valuation of $2.4 billion.

4.3.2.2 Municipal Tax Impacts

Estimated impacts on municipal taxes are based on the removal of taxable properties from the local tax base, resulting from property acquisitions related to project alternatives, and the corresponding decrease in local property tax revenues. These types of direct impacts will occur only in the City of Dover and the Town of Newington where actual project construction would take place. The estimated property tax impacts are based on the assessment of property acquisition described in the previous section. The values of acquired properties that are expected to be a complete taking, as opposed to only a partial taking of land, are based on municipal assessment records as of 2004. For partial land acquisition related to roadway widening, the actual assessed value per acre has been applied although the ultimate value of such acquisitions could vary greatly depending on the characteristics of the property and the amount of land acquired. The estimated acreage to be acquired was calculated using Geographic Information System software in conjunction with digital data layers for both the project alternatives and land parcels in the project area. Average land values for partial land acquisition in the Newington portion of the project are established at approximately $160,000 per acre and $170,000 per acre in

Dover. A summary of municipal property tax impacts is presented in Table 4.3-1. It should be noted that in a few instances where an entire parcel is expected to be acquired, the total local assessed valuation costs in Table 4.3.-1 do not represent an average per acre cost for the total cost identified for acquisition.

As noted in the previous section on property acquisitions, a portion of the estimated land area required for roadway construction is located within the Pease International Tradeport. This land is owned by the state under an agreement with the Federal Aviation Administration and not subject to a local property tax levy. Therefore, no municipal property tax impacts have been assessed for the potential acquisition of this property in the Town of Newington, only for the privately owned land identified for possible acquisition.

Alternative 10A

The construction of Alternative 10A is expected to result in the acquisition of a single residential property (a duplex) and approximately 12 acres of privately owned land in the Town of Newington. The estimated assessed value of this property is approximately $2.07 million, as illustrated in Table 4.3-1, which would reduce future annual property taxes by just over $19,300 for the town. This reduction represents less than one half percent of total property tax revenues raised by the Town in 2004.

Alternative 12A

The only property acquisitions anticipated for this alternative are partial land acquisitions associated with roadway widening at various locations. It is estimated that such acquisitions will affect 14 acres of privately owned land with an approximate assessed value of $2.24 million. This would result in reduced annual property tax revenues of approximately $20,880 for the Town of Newington, which represents less than one half percent of the total property tax revenues raised by the Town in 2004.

Alternative 13

Anticipated property acquisitions for this alternative are comparable to those discussed for Alternative 10A. However, the estimated acreage of privately owned land acquired for this alternative is reduced from 12 to 6 acres. The assessed value of acquired property is approximately $960,000 which would result in a reduction of property taxes for Newington of approximately $8,951 annually, which represents approximately 0.15 percent of the total property tax revenues raised by the Town in 2004.

Alternative 2

As noted in the previous section, Alternative 2 is expected to require the acquisition of two businesses, as well as partial acquisitions of land at various locations in Dover. These properties have an estimated assessed value of $1,112,700, which would result in decreased future property tax revenues for the City of approximately $20,229

annually. This decrease represents less than one percent of the amount raised in property taxes by the City in 2004, which represents less than one tenth of a percent of the total property tax revenues raised by the City in 2004.

Alternative 3

The estimated municipal tax impacts of this alternative are essentially identical to those of Alternative 2. The acquired properties have an estimated assessed value of $1,197,700, which would result in reduced annual property taxes of approximately $21,774, which represents less than one tenth of a percent of the total property tax revenues raised by the City in 2004.

4.3.3 Indirect/Secondary Effects

Considerable research has been conducted over the years in order to evaluate the possible effects that transportation improvements have on future land uses. A review of literature devoted to this issue indicates a majority of analysts agree that investments in highway infrastructure do impact land use within a specific area of upgraded highway facilities. However, the potential impacts can vary greatly depending on the type and function of the existing roadway being evaluated, the type of improvements being proposed, and existing land use characteristics (such as school, local roads, employment base, *etc.*) in the affected area. With regard to the last item, affected area, there is often both a local impact area, which would include properties that have direct or generally immediate access to the transportation improvements, as well as a regional impact area, where the effects are more dispersed within broadly defined boundaries. This dual nature of local and regional impact areas is considered relevant for the proposed Spaulding Turnpike improvements since it is a regional highway facility that also serves an important localized function with regard to access in the project study area in the Town of Newington and the City of Dover.

4.3.3.1 Project Area

Land Uses

All of the proposed project alternatives are designed to upgrade the ability of the Spaulding Turnpike to accommodate regional through traffic, while also reconfiguring local access points to and from the portions of the roadway within Newington and Dover. This section addresses the more localized impacts related to possible changes in land use that may occur in the project area that encompasses portions of these two communities. Other regional land use impacts are discussed in the next section and are based on the output generated by an economic forecasting and policy analysis model.

Alternative 10A

This alternative includes a new network of proposed connector roadways that would link Woodbury Avenue and Shattuck Way, which are located on the east side of the Turnpike, with Arboretum Drive on the west side. The network of proposed connector roadways on the west side of the Turnpike would be located on land that is part of the Pease International Tradeport and subject to the control of the PDA. There are approximately 57 acres of land at Pease bounded by Arboretum Drive, Railway Brook, Pickering Brook, and the Turnpike that would be directly affected, in terms of improved access, due to the new connector roadways. However, the zoning for this area is designated as Natural Resource Protection under PDA's regulations, which limits the types of development that can occur there to uses such as natural resource management (*e.g.* tree farms, wildlife preservation), public utilities, communications facilities, access roads and rail related activities. Therefore, the potential for possible future growth in this area related to the proposed highway construction is limited to these relatively low intensity types of land uses.

These connector roads would also provide an additional means of ingress and egress for the Tradeport that would improve access to the northern section of this facility, where existing roadway approaches are presently limited solely to Arboretum Drive. This portion of the Tradeport, which is adjacent to the airfield's north apron area containing approximately 100 acres zoned for Airport Industrial uses, has experienced limited development. Part of the reason for the lack of development in this area is that the Airport zoning district restricts uses to those that are related to the aviation industry, which has not been a strong growth sector in the region. Improved access to this zoning district could provide an additional incentive for prospective businesses that require proximity to apron/runway facilities to consider the Tradeport during a site selection process. However, improved access is only one factor in attracting future development to this location given that the area is zoned for aviation and this industry has very specialized needs with regard to site development standards and employment.

In addition to the land within the confines of the Tradeport, there is also a 16 acre privately-owned parcel located within the perimeter of proposed connector roads described above. This parcel may be affected, with regard to access, as a result of the improvements. This undeveloped parcel (Newington Assessor's map/lot 12-13), formerly a drive-in theater, has frontage on the Turnpike with access available to the site as right-in/right-out turning movements onto the Turnpike requiring a high speed merge to access or egress the site. The property is zoned for office uses under the Town of Newington's zoning ordinance. Since the Turnpike is proposed to have a limited access right-of-way, a new access point to this property from the proposed connector roadways is part of this alternative. This change will likely make the site more appealing from a development perspective since it would be safer and easier to reach the site from either the northbound or southbound approaches on the Turnpike. This alternative would also require the acquisition of approximately six acres of this parcel in order to construct the new Exit 3 southbound off-ramp,

which would reduce the total amount of development that could potentially occur on the property.

Alternative 12A

With the exception of the location of the connector road linking Shattuck Way with Arboretum Drive, this alternative involves relatively the same configuration as proposed in Alternative 10A. Therefore, the anticipated land use impacts are expected to be the same as discussed in the preceding section.

Alternative 13

From a land use perspective, the configuration of Alternative 13 varies from 10A and 12A primarily in that it does not have a connector road linking Shattuck Way with Arboretum Drive and Nimble Hill Road. Instead, this alternative relies solely on the existing underpass north of Exit 4 to provide this access. A connection is also maintained between Woodbury Avenue and Arboretum Drive as part of Exit 3, which also provides access into the northern portion of the Tradeport. The potential impacts would not be expected to differ substantially from Alternatives 10A or 12A despite the elimination of the connection between Shattuck Way and Arboretum Drive. One notable difference, however, is the fact that this alternative will require a small triangular acquisition of a portion of the former drive-in theater property. Additionally, the parcel will no longer have direct access to the Turnpike. Rather, it would be accessed by a new town roadway, which could be constructed in the future along the abandoned southbound barrel of the Turnpike. .

Alternative 2

From a land use perspective, this alternative is not expected to have any substantial localized impacts on future development patterns in the Dover Point area. Existing development in the area, as well as the overlying zoning district, is predominantly residential in nature with the exception of a small business zone located between the Turnpike and the southern end of Dover Point Road. It is estimated that, with the exception of approximately 25 acres, all the land in this portion of the study area is essentially built-out at this time. The proposed reconfiguration of the existing access points to and from the Turnpike represents fairly minor changes and therefore, would not be expected to affect future land use patterns.

Alternative 3

The configuration of proposed Alternative 3 varies relatively little from that of Alternative 2. Given this fact, the potential localized impacts to future land use in the Dover Point area are expected to be essentially the same as those discussed under Alternative 2 above.

Bridge Alternatives

Neither of the proposed bridge alternatives is expected to have any localized land use impacts within the study area.

Businesses

The results of the economic model, which are discussed later, provide a regional perspective about economic and social changes that may result from implementation of the various project alternatives. However, there may be some minor localized impacts, due to changes in roadway configurations that could affect visibility and access presently available to one business located in the project area. Changes in access or visibility (*i.e.,* how well potential customers can see, or how easily they can get to a business, while traveling on the normal commercial roadway corridors) will affect certain types of businesses more than others. Research conducted concerning impacts on businesses due to highway improvements has identified certain types of businesses as being more traffic-dependent than others. Traffic-dependent businesses tend to rely on pass-by traffic (*i.e.,* traffic passing by or near the frontage of the business) for a substantial portion of their revenues. Businesses that are less reliant on pass-by traffic tend to be destination businesses that will draw customers to the area whether or not they have good visibility or direct access. Generally speaking, retail-oriented businesses are considered to be more traffic-dependent than non-retail businesses. And within the retail sector, businesses such as restaurants, hotels, gas stations, and convenience stores, are considered to be the most dependent on pass-by traffic.

Alternative 10A

Several changes would occur in the existing configuration of access points between the Spaulding Turnpike and the local roadway network within the commercial and industrial areas of Newington, as a result of this alternative. Overall, these changes are not expected to have any negative impacts on area businesses since no existing access points are eliminated, only reconfigured.

The two most substantial changes in access, from a business impact standpoint, resulting from this alternative are the reconfiguration of the exits from the Turnpike to Woodbury Avenue and Nimble Hill Road. Woodbury Avenue is a major retail corridor in the Town of Newington and also provides access to the town's industrial waterfront area. This corridor and its adjacent land area form a regional shopping area that contains in excess of 2.8 million square feet of existing commercial and industrial development. It constitutes a major hub of retail sales and employment that is not expected to be adversely affected by the proposed Exit reconfiguration.

Nimble Hill Road is the corridor that provides access to Newington's town center area and also has a small concentration of office and commercial uses near the existing Exit to the Turnpike. The reconfiguration of this Exit proposed by this alternative would not be expected to adversely affect most of the businesses in this office district area since the types of uses located here are generally not considered to

be traffic-dependent. The only exception to this is the gas station/convenience store located at the intersection of Nimble Hill Road and the southbound lanes of the Turnpike. This establishment currently has direct access to and from the Turnpike. The proposed alternative would maintain the southbound Exit from the Turnpike at Exit 4, but require a more circuitous route to return to the Turnpike *via* a new connector road to Exit 3. Since gas stations tend to be more reliant on pass-by traffic for a greater percentage of their revenues, the proposed change in travel patterns could result in reduced revenues for this business. However, maintaining the southbound Exit at Nimble Hill Road will help to minimize potentially greater impacts that might otherwise be expected to occur if this access point was totally eliminated.

Alternative 12A

The potential impacts to businesses associated with this alternative would not be expected to vary in any substantial way from those discussed under Alternative 10A.

Alternative 13

Alternative 13 would be expected to have essentially the same potential impacts to area businesses as those described for Alternative 10A. The only notable difference is related to the gas station/convenience store located at Nimble Hill Road and Exit 4. Alternative 13 eliminates direct access to the Turnpike. However, this alternative maintains access to the southbound on and off ramps *via* a newly constructed access road adjacent to and south of the ExxonMobil facility. Therefore, there would be no anticipated negative impacts for this business related to changes in travel patterns, as discussed under Alternative 10A above.

Alternative 2

The Dover Point portion of the project area contains approximately seven commercial establishments with an estimated 30,000 square feet of building space. Generally, these businesses are not classified as traffic-dependent in that they do not rely on pass-by traffic for a substantial percentage of their sales. Although there is a restaurant located on Dover Point Road, which is typically classified as traffic-dependent, its current visibility or access will not be affected by the proposed alternative. In fact, the proposed alternative's reconfiguration of Exit ramps and other connecting roadways are not expected to have any localized secondary impacts to businesses located in this portion of the project area.

Alternative 3

The differences in configuration between Alternatives 2 and 3 are inconsequential with regard to potential impacts on area businesses. Therefore, as noted in the previous section, no localized secondary impacts are expected to businesses in this portion of the project area.

Bridge Alternatives

No localized secondary impacts to area businesses are anticipated as a result of either proposed bridge alternative.

Neighborhoods

The impacts related to neighborhood cohesion refer to the potential impacts that can occur when discrete residential areas are bisected, or otherwise divided, by roadway improvements. Disruption of neighborhood cohesion is essentially the result of establishing a "barrier," which is represented by the roadway that disrupts the historical "links" of interaction within the neighborhood.

Residential neighborhoods within the project area potentially affected by the proposed alternatives are found in two primary locations. The first is the Dover Point area of Dover that has two neighborhood areas, with approximately 480 housing units, located on both sides of the existing Turnpike corridor. This includes the Spur Road residential neighborhood. The second is a smaller enclave of approximately 15 houses located on Patterson Lane that is encompassed by the waterfront industrial development along the Piscataqua River in Newington.

Alternative 10A

The Spaulding Turnpike presently represents a barrier that bisects the Town of Newington into two distinct areas requiring residents of the community to merge onto a high-speed roadway in order to cross from one side to the other. This alternative will eliminate this merging maneuver and is generally expected to have an overall positive impact on area neighborhoods since it would improve connectivity between the east and west sides of the Turnpike. The new connections provided between Shattuck Way and Nimble Hill Road will provide safer access to the Newington town center area for Patterson Lane residents. Furthermore, the new link between Woodbury Avenue and Nimble Hill Road will also provide safer access for Newington residents on the west side of the Turnpike when attempting to reach the commercial shopping district on the opposite side of the highway.

Alternative 12A

This alternative would be expected to have the same positive impacts on area neighborhoods, as well as the Town of Newington as a whole, due to improved connectivity between the east and west sides of the Turnpike. The proposed connection of Shattuck Way to Arboretum Drive and Nimble Hill Road, *via* a new Turnpike underpass would in fact, be expected to provide an even more convenient connection point for residents from the Patterson Lane neighborhood when accessing the Newington town center area.

The proposed Pease Rail Spur associated with this alternative does introduce a new right-of-way corridor into the vicinity of the Patterson Lane neighborhood; however, the fact that this rail spur would tie into the existing Guilford rail line north of

Patterson Lane will essentially avoid any disruption to residential access within this neighborhood area.

Alternative 13

This alternative would not be expected to have any adverse impacts on area neighborhoods. Although this alignment would provide a new connection between Woodbury Avenue and Arboretum Drive at the Pease Tradeport, this new Exit configuration will not offer the same degree of improved connectivity for neighborhoods and the Town due to the lack of the industrial connector road discussed for Alternatives 10A and 12A above.

Alternative 2

The Dover Point portion of the project area contains approximately 480 residential dwelling units that are separated into four or five neighborhood groups by the Turnpike corridor and adjoining roadway network. Alternative 2 would result in the realignment of several existing Exit ramps and other connecting roadways that are in proximity to these neighborhood areas. Overall, this alternative is not expected to have any negative impacts on area neighborhoods since the majority of construction would occur within existing highway rights-of-way.

One substantial change is the elimination of Exit 5 that currently provides direct northbound Turnpike access to the Wentworth Terrace neighborhood, an enclave of approximately 20 homes on the east side of the highway. This Exit would be replaced by an improved underpass (*i.e.*, two-way) connecting the neighborhood with Dover Point Road on the west side of the highway. This new roadway configuration would require residents to take a more circuitous route to reach their home when driving north on the Turnpike, but will provide better and safer connectivity to neighborhoods and the park area located on the opposite side of the highway.

Alternative 3

Overall, the reconfiguration of Exit ramps and connector roads associated with this proposed alternative varies in relatively minor ways from those proposed in Alternative 2. The primary exception to this is the proposed construction of a new connecting roadway that would link Boston Harbor Road and Spur Road, *via* a US 4 underpass. This connector would terminate at Boston Harbor Road in proximity to a small enclave of houses, approximately 20 (including a small group of mobile homes), that lies between US 4 and Boston Harbor Road. Although this new roadway would create a perimeter that encircles this enclave of homes, it will not create a new barrier that divides the neighborhood to an extent greater than the current configuration of the present roadway network.

This reconfigured intersection of Boston Harbor Road, Spur Road, and US 4, would also eliminate the existing traffic signal at this location. The new alignment would

provide an underpass that links Boston Harbor Road directly to Spur Road. This change would improve local connectivity between these two neighborhoods.

Bridge Alternatives

No impacts to any neighborhood would be expected as a result of either bridge construction alternative. Both the rehabilitation of the General Sullivan Bridge, or the creation of a new multi-use pathway, would preserve the existing pedestrian/bicycle linkages that presently exist for area neighborhoods.

4.3.3.2 Regional Study Area

As noted earlier, projects such as highway improvements frequently impact communities in a region larger than the immediate area of construction activities. As illustrated in **Figure 1.3-1**, a 33-community socio-economic study area (including all of Strafford County, a portion of Rockingham County, and two communities in Carroll County) was identified for evaluation of indirect economic and social effects.

In order to evaluate possible indirect impacts, various economic and policy models developed by Regional Economic Models, Inc. (REMI)[65] were used to forecast key social and economic indicators relating to the proposed development and to estimate possible induced development in the regional study area.

The base model for this analysis was REMI Policy Insight, a structural economic forecasting and policy analysis model that integrates traditional input-output, general equilibrium, econometric and economic geography methodologies. The model is dynamic, with forecasts and simulations generated on an annual basis with behavioral responses to wage, price and other economic factors. Unlike static models (*e.g.* RIMS II or IMPLAN), REMI tracks the effects of an economic event over multiple time periods, calculating the interrelated impacts as the local and regional economies adapt to these changes. For example, an increase in wages in a particular area results in migration of workers over a period of time to that region, resulting in population growth, new demand for housing and increased competition for existing jobs.

The REMI model consists of thousands of simultaneous equations that use data from a variety of sources, including the Bureau of Economic Analysis and the US Census. The model is multi-regional to the county level, and is based on a comprehensive model of the national economy, developed and maintained by Regional Economic Models, Inc. of Amherst, Massachusetts. It is a proprietary software system, available on a contractual basis that is used extensively by public and private agencies around the country to provide reliable strategic decision support. The REMI model was chosen for its ability to track complex economic changes over time and across geographies, so that short and long-term impacts could be analyzed. However, the

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65 The Regional Economic Model, Inc. website (www.remi.com) provides a wide range of information about both the Policy Insight and Transight models and includes articles about the use of the programs, documentation, tours of the models and download demos.

Policy Insight model only accounts for construction and operational spending impacts. It does not account for transportation efficiency created by projects such as improvements on the Spaulding Turnpike.

In order to incorporate improved economic efficiency due to transportation improvements, the REMI TranSight model was also used. The TranSight model provides a link between the proposed transportation improvements on the Spaulding Turnpike and the economic vitality of the region by converting changes in travel efficiency into economic output. These simulations are then entered into the Policy Insight model to project possible impacts. For example, while jobs will be created because of the construction and operation expenditures of a particular scenario, more substantial long-term job creation and economic development will likely occur as a result of improved transportation efficiency in the region.

Traditionally, the link between transportation improvements and the economy has been viewed as a reduction of business costs. The TranSight model employs new economic geography theory to examine the importance of transportation systems to a region's economy. The theory uses effective distances between products and employees to simulate transportation projects. By simulating a change in distance (measured by travel time between separate regional economies), the model can change the relationships among economies. Depending on the economy's existing market-share size in each industry, a change in the transportation infrastructure between the areas can, over time, shift the market shares of these industries. In other words, the economic geography can project the future economic impacts associated with the implementation of transportation improvements. The methods used to bridge the gap between analysis of transportation projects and total economic activity is based on the concept of effective distance.

One of the defining characteristics of this theory is how it describes the dependency of economic systems on the cost of transportation. The costs to move intermediate inputs, final goods, and labor directly affect a firm's production costs. In other words, a firm's production costs increase as its transportation costs rise. The three main transportation factors in production costs are a firm's access to intermediate inputs, access to labor, and the firm's ability to deliver their goods and services to consumers.

Effective distance describes the logistical efficiency between regions. The concept is based on the gravity model in economic geography. A gravity model describes how firms in similar industries tend to "gravitate" towards each other to keep production costs low. This effect is also called agglomeration of industries. The amount of gravitation toward the economic center of a region depends on the effective distance between firms. A firm will want to decrease its effective distance to reduce its production costs.

There are several ways to alter the effective distance between regions. One is to move a firm geographically closer to its intermediate inputs. Another way is to alter the

modes of transportation by adding new or improving existing arteries or modes of transportation. For example, adding a new highway lane can decrease congestion, making transportation quicker and more efficient. Reducing the effective distance for intermediate inputs, laborers and/or shipping finished goods lowers the production costs of a firm. In turns, the firm gains a competitive advantage in price, increasing its market share and promoting growth. Conversely, an increase in effective distance can have a negative affect on a firm, increasing its delivered price and therefore reducing its market share.

For purpose of this analysis it was determined that the key transportation options involved the size of possible bridge improvements (six or eight lanes), estimated construction costs, changes in travel time, and the length of the construction period (5 years). This information, outlined in Table 4.3-2, was then entered into the TranSight model to determine the economic impact of each bridge alternative (six or eight lanes) in order to calculate the economic impact of each alternative. The results were then used with the Policy Insight model to project future economic and social impacts.

Table 4.3-2
REMI Model Inputs

Bridge Travel Lanes	Estimated Construction Cost (million) [2]	Estimated Change in Travel Time 2005 -2025 (Minutes) [1]			
		AM		PM	
		Southbound	Northbound	Southbound	Northbound
No-Build (Four Lanes)		7.5	0.7	3.5	10.7
Six Lanes	$127.5	0.2	0.4	0.0	-3.1
Eight Lanes	$138.3	-2.6	0.3	-0.9	-6.2

Notes:
1 Estimated travel time through the project area (Exit 1 to the Dover toll plaza)
2 Estimated construction cost is based on 2004 dollars

No-Build Alternative

Using the REMI Policy Insight model, key social and economic effects for the No-Build Alternative were identified. Under this approach, changes from 2005 to 2025 that addressed the following key indicators were projected for both Strafford and Rockingham Counties (see Table 4.3-3).

- Population – Changes in population are an indication of the desirability of an area as a place to live. Regions that provide the most attractive combination of quality of life, employment opportunities, recreational amenities and ease of access to other regions tend to experience the largest population gains.

Conversely, areas that have poor employment opportunities, have low quality of life, and are geographically remote or isolated, tend to have flat or negative population changes.

Table 4.3-3
Key Social and Economic Indicators

	2005	2025	Total Change	Percent Change	Avg. Change/ Year
Strafford County					
Population	117,637	139,825	22,188	18.9%	0.9%
Employment	58,758	69,433	10,675	18.2%	0.9%
Gross Regional Product (Billion)	$3.3	$6.7	$3.4	103%	5.2%
Disposable Income (Billion)	$2.9	$4.7	$1.8	62%	3.1%
Rockingham County					
Population	297,749	368,402	70,653	23.7%	1.2%
Employment	188,198	228,345	40,147	21.3%	1.1%
Gross Regional Product (Billion)	$13.8	$28.9	$15.1	109.0%	5.4%
Disposable Income (Billion)	$10.3	$17.3	$7.0	67.9%	3.4%

Notes: Data from REMI and RKG Associates, Inc. Since only two communities in Carroll County (Brookfield and Wakefield) were part of the study area, data for Carroll County was not included in this table.

- As indicated in Table 4.3-3 the population in both Strafford and Rockingham Counties is projected to increase by about 18.9 percent (22,188) and 23.7 percent (70,653) respectively, over the 20-year period. This equates to about 0.9 percent per year for Strafford County and 1.2 percent per year for Rockingham County. Historically the population of Strafford County grew at an average yearly rate of 1.6 percent between 1970 and 2000, but only 0.7 percent between 1990 and 2000. In Rockingham County the population increased by 2.3 percent per year between 1970 and 2000, but only 1.2 percent per year between 1990 and 2000. On a comparison basis, the New Hampshire Office of Energy and Planning projects that by 2025 Strafford County will have a population of 142,870 (a rate of yearly increase of 0.97 percent between 2000 and 2025) and that Rockingham County will have a population of 356,800 by 2025 (a rate of increase of 1.01 percent between 2000 and 2025).

- During the period from 1990 to 2000, the average number of persons per household has declined from 2.6 to 2.5 in Strafford County and from 2.72 to 2.63 in Rockingham County. This trend is expected to continue. Based on an estimated average of 2.4 persons per household it is projected that these population changes by 2005 will result in an increase of 9,245 household (approximately 462 per year) in Strafford County and 29,438 (approximately 1,472 per year) in Rockingham County. It should be noted that the communities in the Rockingham portion of the study area only represent about 40 percent of

the total number of households (104,586) located in the County during the 2000 US Census. Based on this simple percentage, yearly household increases in the Rockingham portion of the study area would equate to about 588 per year or approximately 11,775 over the twenty-year period.

- Employment – Similar to the population growth, changes in employment levels are a good indicator of economic vitality within a region. Regions that provide competitive advantages to businesses, including lower labor, transportation and fuel costs, will attract more commercial development than those that have high costs for doing business. As illustrated in Table 4.3-3, employment would increase by about 18.2 percent (10,675) in Strafford County and 21.3 percent (40,147) in Rockingham County. This equates to a yearly increase of about 0.9 percent in Strafford County and 1.1 percent in Rockingham County. Between 1990 and 2002 employment increased in Strafford County by 5,010 (about 0.9 percent per year) and by 26,720 (about 1.4 percent per year) in Rockingham County.

- Gross Regional Product – The concept of Gross Regional Product (GRP) is a measure of total economic output analogous to Gross Domestic Product, which is used to describe national economic activity. The REMI model measures the past and projected GRP for each County. In Strafford County, it is projected that the GRP will increase by $3.4 billion or about 5.2 percent per year. In Rockingham County, the GRP will increase by approximately $15.1 billion or about 5.4 percent per year.

- Real Disposable Income – Real disposable personal income measures the amount of net income remaining for all employed persons that live within a particular region after adjusting for taxes and cost of living. Changes in real disposable personal income indicate whether the wages of residents are increasing faster, slower or at the same rate as their basic expenses. Increases in average real disposable personal income is generally an indicator of positive job growth and increases in salaries and wages above basic expenses. Conversely, a decrease in real disposable personal income is an indication that taxes and cost of living are increasing faster than salaries and wages. The real disposable income (in fixed dollars) is projected to increase by about $1.8 billion in Strafford County (about 3.1 percent per year) and $7.0 billion in Rockingham County (about 3.4 percent per year).

Build Alternatives

As discussed earlier the TranSight model was used to identify possible economic changes based on specific impacts relating to estimated construction costs and changes in travel time (minutes) related to the two Turnpike widening (six and eight lanes) alternatives (Table 4.3-2). The results of these changes were then used with the Policy Insight model to project future economic and social impacts. Outlined below are the results of this analysis, in terms of changes to the No-Build results (such as

increases in population and households) for the two basic bridge alternatives – six lanes and eight lanes.

- Population – Based on this analysis, it is estimated that the Six-Lane Alternative would result in an increase in population by 2025, of 905 in Strafford County and 452 in Rockingham County over the No-Build Alternative, for a total population increase of 1,357. The Eight-Lane Alternative would result in a total population increase of 1,865 over the No-Build Alternative. Strafford County's population would increase by 1,151 compared to 714 in Rockingham County (Table 4.3-4).

Table 4.3-4
Projected Population and Employment Changes from No-Build Alternative for 2010 and 2025

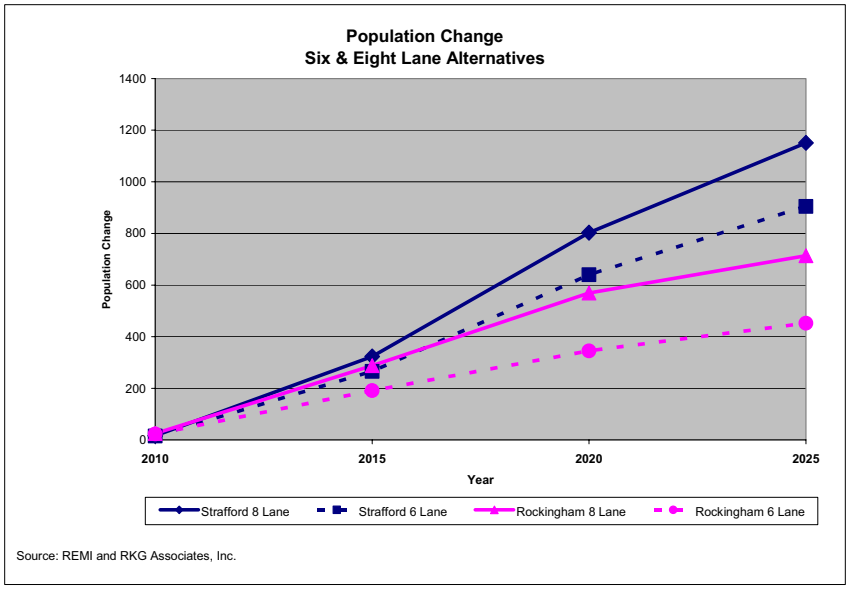
	Six-Lane		Eight-Lane	
County	**2010**	**2025**	**2010**	**2025**
Strafford				
Population	15	905	16	1,151
Employment	134	737	146	887
Rockingham				
Population	23	452	25	714
Employment	189	613	205	1,010
Strafford & Rockingham				
Population	38	1,357	41	1,865
Employment	323	1,350	351	1,897

As illustrated in **Exhibit 4.3-1**, most of the population increase would occur after 2015 when bridge construction is completed. Based on a similar estimate of 2.4 persons per household, the population increase would result in an additional 377 households in Strafford County under the Six-Lane Alternative and 480 households under the Eight-Lane Alternative. In Rockingham County the increase in households would be 188 (six-lane) and 298 (eight-lane). However, because the communities located in the regional study area represent only about 40 percent of the households in Rockingham County, the total number of increased households for the study area are estimated at 452 (75 in Rockingham) for the Six-Lane Alternative and 600 (120 in Rockingham) for the Eight-Lane Alternative by 2025.

- A comparison of projected population difference for the year 2025 between the Six and Eight-Lane Alternatives was larger for Rockingham County (262) than Strafford County (246). It is also noted that the difference in employment was larger in Rockingham County (397) than Strafford County (150). Also, the projected population difference between the two counties for both alternatives indicates that the increase in Strafford County is greater than Rockingham

County. As illustrated in **Exhibit 4.3-1**, the change in Strafford County is increasing at a faster rate than Rockingham County.

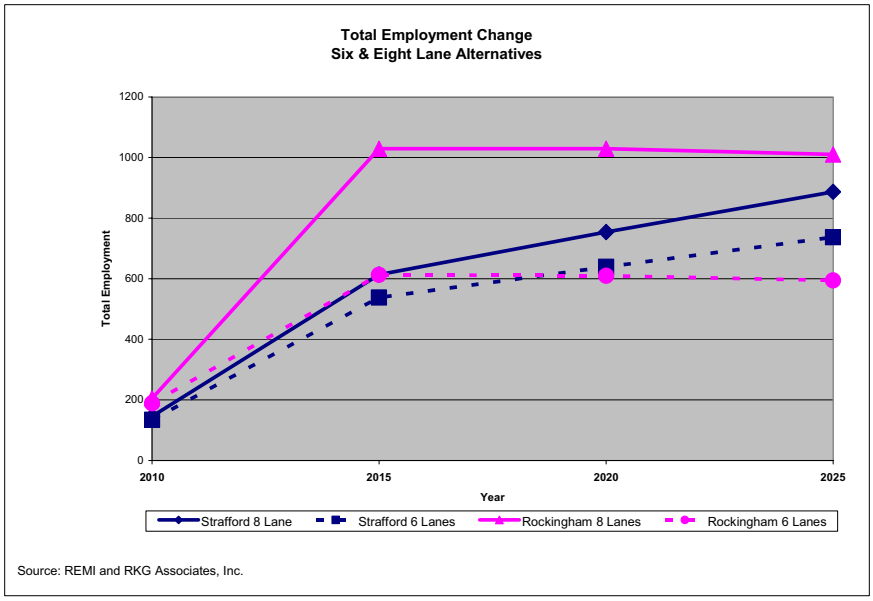
Exhibit 4.3-1



- Employment – Similar to population increases, it is projected that most of the employment increases would also occur after 2015. As indicated in Table 4.3-4 and **Exhibit 4.3-2**, employment in Strafford County, by 2025, would increase by 737 under the Six-Lane Alternative and 887 under the Eight-Lane Alternative over the No-Build Alternative. In Rockingham County the increase, by 2025, would be 613 (Six-Lane Alternative) and 1,010 (Eight-Lane Alternative). This equates to a total increase of employment of 1,350 (Six-Lane Alternative) and 1,897 (Eight-Lane Alternative) by 2025.

  As noted earlier in Table 4.3-3, it is projected that employment will increase at 1.1 percent per year in Rockingham County between 2005 and 2025. This compares to a yearly rate of 0.9 percent in Strafford County during the same time period. Exhibit 4.3-2 indicates that under the two Build Alternatives, additional employment growth related to the Build Alternatives (six-lane and eight-lane) increases at a faster rate in Strafford County than Rockingham County. In fact, additional employment growth, beyond the No-Build level in Rockingham County, levels off after construction is complete only for the additional increment of employment growth due to new construction.

Exhibit 4.3-2

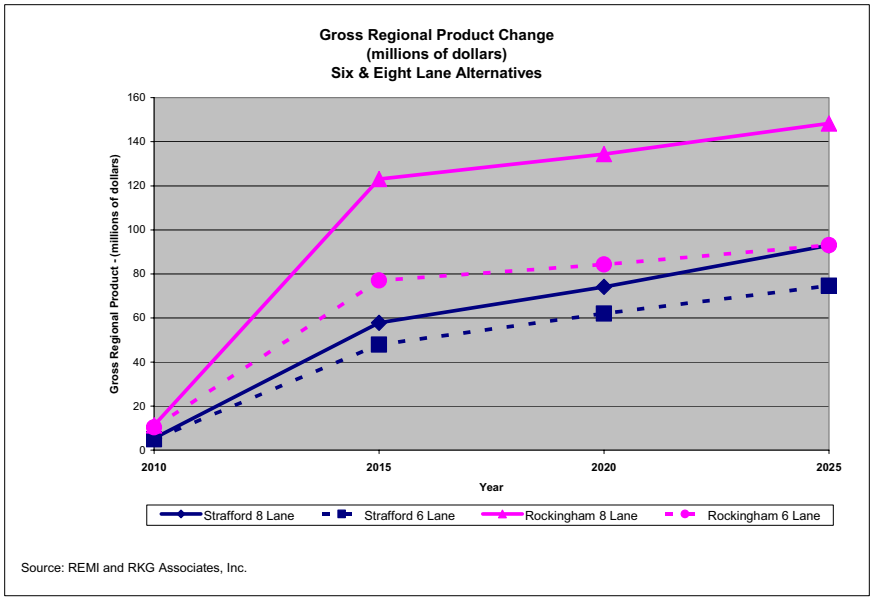


Source: REMI and RKG Associates, Inc.

- The employment numbers under the Eight-Lane Alternative are also larger (Table 4.3-4), but as illustrated in **Exhibit 4.3-2**, the rate of change in Rockingham County is declining (after 2015) in comparison to Strafford County (Eight-Lane Alternative). It needs to be emphasized that the population and employment base is substantially higher in Rockingham County than Strafford County (see Table 4.3-3). That data indicates that in 2005 the population of Strafford County was about 40% of Rockingham County and employment in Strafford County was about 31% of Rockingham County. It is estimated that a similar relationship will occur in 2025. Consequently, the growth of Rockingham County in terms of population and economic activity, with or without the bridge alternatives, will continue to expand.

- Gross Regional Product – Changes in gross regional product (GRP) increase substantially after 2015 (See **Exhibit 4.3-3**). By 2025 GRP in Strafford County increases by approximately $74.6 million under the Six-Lane Alternative and $93 million under the Eight-Lane Alternative. In Rockingham County GRP increases by $93.1 million (Six-Lane Alternative) and $148 million (Eight-Lane Alternative). It should be noted, however, that a portion of the GRP in Rockingham County included communities not located in the study area.

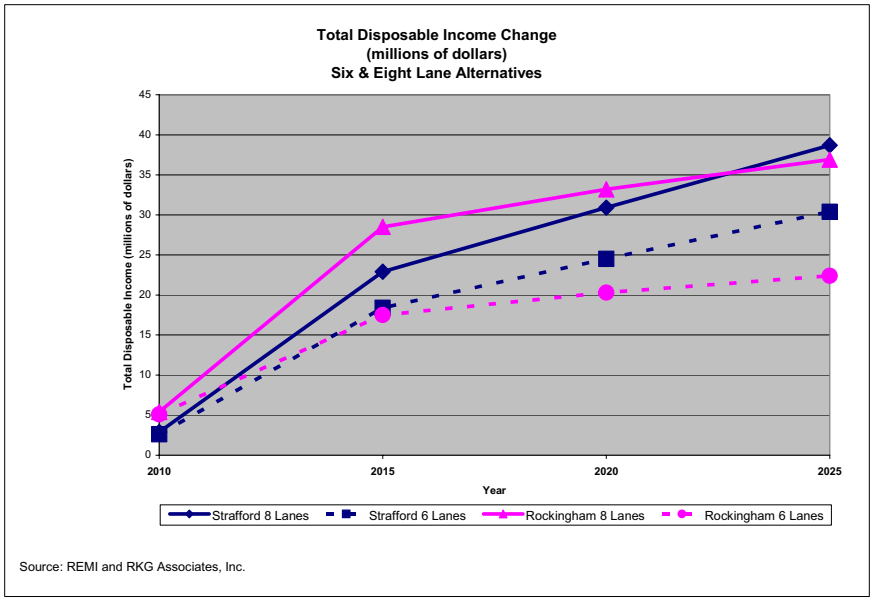
Exhibit 4.3-3



Source: REMI and RKG Associates, Inc.

- Disposable Income – Similar to the GRP, disposable income increases both in Strafford and in Rockingham Counties (See **Exhibit 4.3-4**. Strafford County increased by $30.4 million in 2025 under the Six-Lane Alternative and $38.7 million under the Eight-Lane Alternative over the No-Build Alternative. In Rockingham County, the increase is $22.4 (six-lane) and $36.9 (Eight-Lane Alternative). In Rockingham County's case, the increase levels off after 2015 under both build alternatives.

Exhibit 4.3-4



Source: REMI and RKG Associates, Inc.

- Housing - As noted earlier, it is projected that under the No-Build Alternative over 9,245 households (approximately 462 per year) would be established in Strafford County and 11,775 households (approximately 588 per year) in the Rockingham County portion of the study area by 2025. This equates to an increase of about 21,020 households in the study area by 2025 or approximately 1,051 households per year. The two Turnpike widening alternatives (six-lane and eight-lane) would increase the number of households to 21,472 (Six-Lane Alternative) and to 21,620 (Eight-Lane Alternative).[66] This represents an increase of 452 households for the Six-Lane Alternative and 600 households for the Eight-Lane Alternative. This equates to a 2.2 percent increase in households for the Six-Lane Alternative and 2.9 percent increase in households for the Eight-Lane Alternative as compared to the No-Build.

Construction Employment

Based on the use of the REMI model, it is estimated that both build alternatives would create approximately 330 temporary jobs during the construction period relating to the two bridge alternatives and associated roadway improvements. Another methodology indicated that based on the Build Alternative (six or eight lanes) the construction jobs could range from a low of 310 to a high of 390. [67]

4.3.4 Cumulative Impacts

In addition to these possible changes related to the Spaulding Turnpike project, there are also other past, present and future development activities that could impact the study area. These possible cumulative impacts are described below.

4.3.4.1 New Hampshire Seacoast Region Wastewater Management Study

In 2003, the Great Bay Estuary Commission was created by the New Hampshire State Legislature to work with the NHDES to examine options for addressing wastewater treatment and disposal, restoring the estuary habitat, and creating a watershed district for the Great Bay Estuary. The Great Bay Estuary is a tidally dominated embayment covering approximately 17 square miles, with 144 miles of shoreline in both Strafford and Rockingham Counties.

In the fall of 2004, an 18-month feasibility study was initiated with the purpose of weighing alternatives to meet the wastewater and septage management needs of the 44 communities. (These 44 communities include all 33 of the municipalities in the Spaulding Turnpike project study area). There are 16 wastewater treatment plants in the study area that discharge treated wastewater into streams that empty into the Great

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66 Between 1990 and 2000 over 1,052 households per year were created in the study area.
67 Based on *Regional Multipliers: A User Handbook for the (Regional Input-Output Modeling System (RIMS II)*, published by the US Department of Commerce, 1992

Bay Estuary. Thirty-one communities in the region currently have no municipal collection or treatment systems, relying on private on-site septic systems.

The ultimate goal of the study is the identification of four preliminary alternatives for final evaluation that will be vetted using water quality, engineering, economic, environmental impact, and public acceptance criteria, as well as 20-year growth projections for the region. Possible alternatives include:

Upgrade to advanced treatment: Upgrade existing plants to advanced wastewater treatment and continue to discharge treated effluent at present locations.

Discharge to the Atlantic Ocean: Continue with the same level of treatment, with discharge of treated effluent to the Atlantic Ocean. Three alternatives discharge sites at different distances from the shore will also be evaluated.

Advanced treatment with land application of treated effluent: Upgrade the existing plants to advanced wastewater treatment and discharge treated effluent *via* land application (up to four sites will be evaluated).

Build a new regional wastewater treatment facility: Replace the existing treatment plants with a new regional wastewater treatment facility with secondary treatment and a regional wastewater conveyance system. Treated effluent would be discharged to the Atlantic Ocean at one of three alternative sites at different distances from the shore. Septage receiving treatment would also occur at the regional wastewater facility.

For the first three options, non-sewered communities with a need for a wastewater treatment facility would build a collection system and connect to one of the existing wastewater plants. In addition, septage receiving treatment would be considered if septage capacity were over one million gallons per day. These changes could substantially alter development patterns within the study area.

4.3.4.2 Pease International Tradeport

The redevelopment of the Tradeport, formerly Pease AFB, is a substantial economic initiative within the study area. Since the closure of the base in 1991, it has evolved into a major hub of commercial, industrial, and airport-related land uses that is located adjacent to the southern edge of the project area. As of 2003, approximately 2.6 million square feet of buildings have been constructed, renovated and occupied since the facility was converted to civilian use. According to the PDA, the agency overseeing redevelopment of the property, an additional 278,000 square feet are under construction and 436,500 square feet have been approved for future construction.

Although development is still occurring at the Tradeport, the facility has not remained unaffected by past economic downturns. According to a 2003 real estate

report, office and industrial vacancy rates were 20 percent and 30 percent respectively, at the end of 2002. This represented approximately 639,000 square feet of unoccupied space at the facility. Given current economic conditions, these vacancies, which are primarily attributed to recent high-tech downsizing, are being slowly absorbed by the market.

Remaining undeveloped land at the Tradeport totals approximately 110 acres of commercially and industrially zoned land (some of which is constrained by wetlands) and 110 acres of airport-zoned land. Although this is a relatively small amount of acreage in terms of the Tradeport's total land area, there is still potential for substantial building square footage to be developed in the future, based on a transportation plan[68] completed for the facility in 2002. Estimates presented in that report suggest that an additional 1.5 million square feet of buildings could potentially be constructed at the Tradeport in the future. Some of this development represents the expansion of existing facilities, but also includes the potential for construction of 300,000 square feet related to aircraft manufacturing, expansion of the commercial airport passenger terminal and New Hampshire Air National Guard operations, as well as other new office, industrial, and hotel uses.

It should be noted that the build out of the Tradeport is included in the land use component of the Seacoast Travel Demand Model. Thus, the future transportation demand created by Tradeport development is included in the traffic modeling for this EIS and is therefore accounted for in the Preferred Alternative.

4.3.4.3 Liberty Mutual Expansion

The Liberty Mutual Insurance Company, a Boston-based international insurance company, is in the process of a major expansion of its existing office facility complex in the City of Dover. The office complex, located on Sixth Street in Dover with direct access to Exit 9 of the Spaulding Turnpike, *via* Indian Brook Drive, was constructed during the mid-1990s when the company first established facilities at this location.

The company presently employs approximately 1,400 people at this site, which contains roughly 255,000 square feet of building space on 220 acres. The planned expansion will add 300,000 square feet to the site and still allow land for future growth. The company expects to add approximately 1,600 additional workers in the new facility, which will bring the total employees on-site to approximately 3,000, making it the largest employer in the city.

Liberty Mutual also employs 1,400 people at its Borthwick Avenue facility in Portsmouth, as well as 1,100 at leased facilities at other Seacoast locations. Although no official announcements have been made, it is anticipated that the company will relocate some portion of its employees from leased facilities to the new building in

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68 *Update - Pease Surface Transportation Master Plan*, Vanasse Hangen Brustlin, Inc. October, 2002.

Dover. This could result in a shift in traffic commuting patterns along the Spaulding Turnpike corridor

4.3.4.4 Regional Retail Expansion

Like many areas of the country, Strafford and Rockingham Counties have experienced growth in the retail sector of the economy driven largely by the construction and expansion of what is commonly referred to as "big box retailers," such as Wal-Mart, Home Depot, and Lowe's. Although these retailers have numerous locations within the study area, one recent development of regional significance is the Epping Crossing project located at the intersection of NH 101 and NH 125 in the Town of Epping. This site will ultimately contain approximately 450,000 square feet of retail space that includes a Wal-Mart Supercenter and a Lowe's Home Improvement store. Potential future development on an adjacent site includes 200 acres of industrial land. This development is substantial in that it represents a new major retail hub on the NH 125 corridor between Plaistow and Rochester that is likely to result in additional satellite development around this highway interchange. This will attract consumers, who had previously frequented other retail locations within the study area.

The Epping Crossing development project, based on building size or number of employees, is in and of itself considered a project of regional significance. However, retail expansion within the Spaulding Turnpike regional study area has exhibited overall growth trends over the last decade and a half that are considered substantial from a cumulative impact perspective. These trends might best be defined as a decentralization of retail growth. The term decentralization is used in this case to refer to growth outside the historical retail centers located, for example, in areas such as Portsmouth, Dover, Rochester, and Newington. In some instances this decentralized growth has resulted in the expansion of existing "second tier" retail areas like NH 33 in the Stratham/Exeter area. In other cases, it represents the establishment of new retail nodes in areas like US 4 in Northwood or the Lee Traffic Circle, at the intersection of NH 125 and US 4, in Lee.

The occurrence of this decentralized retail growth does not mean that the historical retail centers have stagnated. On the contrary, these areas have both expanded and experienced in-fill and redevelopment of existing sites. The fact that these historical areas have continued to grow while secondary and rural areas have also expanded or been established is interpreted as an indication that population levels within the study area have reached substantial thresholds capable of supporting these outlying retail locations. This type of growth has ramifications for traffic and commuting patterns as a whole within the study area that may result in a redistribution of traffic levels and congestion areas that affects a broader portion of the regional roadway network.

4.3.4.5 Spaulding Turnpike Improvements, Exits 11 - 16

In addition to the Spaulding Turnpike improvements that are the subject of this EIS, other improvements from Exit 11 to Exit 16 are planned, which were analyzed in a 2001 Environmental Assessment, and which are currently in final design.

Within the City of Rochester, the Turnpike's limited two-lane capacity is taxed by commuter and recreational-related through traffic in conjunction with locally generated residential and employment-related traffic. North and south travel lanes are not separated in this area, which presents an unsafe condition for this high-speed Turnpike facility. The purpose of the Rochester project is to alleviate existing and projected levels of congestion and improve safety on this two-lane section of the Spaulding Turnpike, and to relieve resulting traffic problems at interchanges and intersections with city streets.

Peak hour traffic flow along the Turnpike between Exit 12 and Exit 16 is capacity constrained (Level of Service E) and subject to congestion and long delays in both northbound and southbound directions. In addition, the Exit 12 northbound and southbound off-ramp intersections with Route 125, the Farmington Road intersection with the northbound on and off-ramps at Exit 15, and the Washington Street/Walnut Street/North Main Street intersection also operate at capacity. Off-ramp turning movements are difficult and subject to long delays. As such, peak hour traffic congestion results in delays on the Turnpike and within the influence areas of the interchanges.

The current need to increase Turnpike capacity and to plan for future improvements, that include the upgrade of the interchange areas, has been heightened by several factors. Regional population and employment growth trends are expected to continue. Expansion of the Port of Portsmouth and the redevelopment of Pease Air Force Base have also taken place. Local Rochester development pressures have continued, particularly in proximity to interchange areas such as Exit 13. Several areas of on-going and projected residential and industrial development do not have direct access to the Turnpike, and traffic from these areas must pass through the center of Rochester to connect with the Turnpike or other east-west highways.

The project would align new northbound and southbound roadways between the west and east side of the existing Spaulding Turnpike. This alignment would begin at a point 2,000 feet south of Exit 12 with a new southbound roadway constructed to the west of the existing Turnpike as far as Exit 13. In the vicinity of the bridge crossing with Exit 13, this alternative would begin a weave to the east, where the existing Turnpike would become the southbound roadway and the proposed barrel would be the northbound roadway. This alignment would be maintained until Exit 15 where the alignment would weave back to the west side.

The proposed roadway would travel over the Cocheco River north of Exit 15 and bridge over the former B&M Railroad right-of-way and Chestnut Hill Road. Parallel structures would be constructed west of the existing structures at the Cocheco River, B&M Railroad and Chestnut Hill Road. The existing structures would be maintained in this area for northbound traffic. The roadway would also pass over the Chestnut Hill Road Connector and the Route 16 Connector. After passing the Exit 16 northbound and southbound on- and off-ramps, respectively, the Turnpike would be tapered to meet existing conditions (one lane in each direction, undivided roadway). The limit of work would be approximately 5,500 feet north of the Exit 16 interchange.

4.3.4.6 Spaulding Turnpike, Exit 10

The Spaulding Turnpike is the only road providing limited access, freeway service from Interstate Route 95 in Portsmouth to the tri-city area of Rochester, Dover and Somersworth. However, there is no direct interchange access from the Spaulding Turnpike to the City of Somersworth. Due to the lack of a direct connection to Somersworth, access to this city from the Spaulding Turnpike is presently provided at Exits 9 and 12.

The State Legislature enacted the Laws of 1993, Chapter 259, which directed NHDOT to proceed with the environmental study necessary for the construction of Exit 10 and the necessary road network to connect the new interchange to a major highway east and west of the proposed interchange.

The basic purpose of the Exit 10 project is to improve the regional transportation system, thereby providing opportunities for orderly and coordinated economic development within the tri-city region of Dover, Rochester and Somersworth by enhancing access to the Spaulding Turnpike from the east.

The study of Exit 10 is on-going and the Selected Alternative has yet to be formalized. However, the NHDOT's recommended alternative includes a new interchange located in Rochester, just south of the Blackwater Road underpass of the Spaulding Turnpike, with a connecting road extending easterly for approximately two miles where it would intersect along Interstate Drive with NH Route 108. It then extends further east to West High Street. Creation of the new Interchange will have direct environmental effects which are the subject of a NEPA study.

4.3.5 Indirect Land Use Impacts

This subsection evaluates the potential indirect land use impacts resulting from the Spaulding Turnpike Improvements. As part of the evaluation, the amount of land development associated with secondary growth is discussed, and the general effects on environmental resources that would be most vulnerable to such indirect land use impacts are identified and discussed.

Indirect impacts are those impacts caused by the proposed project that occur later in time and removed in distance, but are still reasonably foreseeable[69]. For this project, indirect impacts may be more specifically defined as those impacts that may result from the Spaulding Turnpike Improvements outside of the immediate study area. Such impacts may be influenced by the increased traffic capacity of the highway and the resultant improved accessibility within the area served by the Turnpike. Indirect impacts to natural resources would typically result from the conversion of existing undeveloped lands that contain such resources to residential, industrial, commercial and governmental land uses. In addition, indirect impacts can have a positive impact on socio-economic resources in terms of improving the potential for more housing and employment opportunities.

While the expected indirect growth resulting from the improvements to the Turnpike are minor, a concern has been expressed that suburban development would accelerate as a result of improved highway capacity and due to incremental decision-making by local communities in the socio-economic study area (see **Figure 1.3-1**). To assess this concern and meet the requirements of the National Environmental Policy Act (NEPA) of 1969, potential indirect land use impacts have been considered and presented below.

4.3.5.1 Alternatives Considered

For discussion of indirect land use impacts, the No-Build Alternative and an Eight-Lane (or Build) Alternative were considered, consistent with the methodologies used to project indirect socio-economic effects for the regional study area (See Section 4.3.3).

The No-Build Alternative assumed that no capacity improvements or substantial safety improvements would be constructed along the project corridor. The Eight-Lane Alternative assumes that the highway would be widened to four lanes in both the northbound and southbound directions between Exit 3 and Exit 6.

It is consistent with the recommendations discussed in Chapter 2 to consider only the Eight-Lane Alternative. Specifically, it was determined during the project planning that widening the Turnpike to six lanes in conjunction with a range of transportation system improvements and travel demand management strategies would not provide sufficient traffic capacity for the design year (2025). This Six-Lane Alternative therefore does not meet the project purpose and need. Thus, although a Six-Lane Alternative was modeled and discussed in Section 4.3.3.2, it was not carried forward for analysis of impacts to environmental resources and will not be discussed in this section.

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69 The phrases “secondary impacts” and “induced growth” are often used interchangeably with “indirect impacts,” which are specifically defined by CEQ regulations [40 CFR 1508.8].

4.3.5.2 Land Conversion Methodology

Land development and associated impacts depend on general regional and statewide economic conditions, federal and state permitting requirements, local zoning and land use ordinances and their administration, as well as the decisions of individual landowners. Given these influences and changing conditions over time, it is difficult to forecast with a high level of confidence the specific areas that may be developed, and the impacts of such development, under the No-Build and Eight-Lane Alternatives. However, an approximation of the total amount of land conversion due to secondary growth can be estimated.

In order to estimate the potential effect of indirect land use development on land conversion and environmental resources in the study area, the following procedure was used:

1. The rate of land conversion on a per capita basis was estimated by establishing a correlation (using a linear regression method) between the population of each of the communities in the study area and the amount of developed land in each of those communities.
2. The REMI model's estimates of population growth by 2025 were converted into land area needed (in acres) to accommodate consequent indirect land use development.
3. The general locations of environmental resources in the socio-economic study area were identified by using available GIS data; and
4. The amount of each environmental resource within the study area was extrapolated from historic rates of land consumption to estimate total additional environmental resource impacts.

Because the amount of additional population growth is relatively minor, it was determined that an attempt to allocate this secondary growth at any level below the county level would be overly speculative and provide little valuable information. Therefore, the analysis predicts natural resource impacts at the county level, even though data at the municipal level is used to establish the relationship between population and land conversion.

Developed land was identified from the New Hampshire Land Cover Assessment GIS dataset developed by the Complex Systems Research Center at NH GRANIT (Justice, *et al.* 2002). Developed lands were initially identified as "Residential/ Commercial/Industrial Development" areas in the data set. Total land areas and total developed lands for each of the study area towns were then estimated from these GIS data. Population for each community in the socio-economic study area was taken from the US Census Bureau's statistics for the 2000 Census.

Based on initial results of the analysis, it was determined that using only the "Residential/Commercial/Industrial Development" land category substantially underestimates the total amount of developed land in many communities within the study area, especially in more rural areas. To eliminate this bias, following a review of the distribution of land use categories in a sub-set of study area communities, it was determined that inclusion of four land cover categories in the spatial definition of "developed area" provided a conservative, yet more reliable estimate:

- Residential/Commercial/Industrial Development;
- Transportation;
- Disturbed Land (*e.g.*, gravel pits, construction sites);
- Other Cleared (*e.g.*, cleared areas in rural neighborhoods).

The resulting rates of land consumption are presented in Table 4.3-5.

Using the relationship of population to total developed area in a community is a simple approach to projecting land use attributable to secondary growth. However, the regression analysis on the data above indicates a very strong relationship between the two measures as shown in Exhibits 4.3-5 and 4.3-6. This relationship also allows a projection of the total amount of future developed land in each county under the No-Build and Eight-Lane Alternatives. Table 4.3-6 summarizes these data.

Using this approach, it is estimated that the study area communities in Rockingham County will contain approximately 14,849, acres of newly-developed land in 2025 under the No-Build Alternative, and approximately 14,987 acres under the Eight-Lane Alternative. Approximately 6,872 acres of newly-developed land are projected for Strafford County in 2025 without the project, while that amount increases to approximately 7,142 acres if the Eight-Lane Alternative is constructed. The net difference in developed land between the No-Build and Eight-Lane Alternatives is therefore approximately 138 acres and 270 acres for Rockingham and Strafford Counties, respectively.

It is important to note that nearly all of the growth in the study area is expected to occur regardless of whether the Turnpike is improved or not. Growth is expected to occur, even without the project, in response to other influences (such as the cost of housing) involving the overall quality of life conditions and continued economic prosperity found in New Hampshire. In addition, it is not clear whether the additional growth, and the associated land conversion, is growth that otherwise would not occur, or growth that would simply occur later in time if the project were not completed.

Table 4.3-5
Per Capita Land Consumption, Socio-Economic Study Area

Municipality	Developed Land[1] (acres)	Total Area (acres)	Population (2000 Census)	Land Consumption Rate (acres/person)
Rockingham County				
Brentwood	2,736	10,863	3,197	0.86
East Kingston	1,271	6,381	1,784	0.71
Epping	3,623	16,776	5,476	0.66
Exeter	3,349	12,813	14,058	0.24
Fremont	2,057	11,142	3,510	0.59
Greenland	2,173	8,524	3,208	0.68
Hampton	3,349	9,073	14,937	0.22
Hampton Falls	1,241	8,078	1,880	0.66
Kensington	1,342	7,668	1,893	0.71
New Castle	313	1,348	1,010	0.31
Newfields	770	4,647	1,551	0.50
Newington	2,238	7,917	775	2.89
Newmarket	2,277	9,080	8,027	0.28
North Hampton	2,441	8,923	4,259	0.57
Northwood	2,033	19,357	3,640	0.56
Nottingham	2,564	30,997	3,701	0.69
Portsmouth	5,813	10,763	20,784	0.28
Rye	2,357	8,406	5,182	0.45
Seabrook	2,379	6,161	7,934	0.30
South Hampton	688	5,147	844	0.81
Stratham	2,594	9,902	6,355	0.41
Strafford County				
Barrington	4,001	31,117	7,475	0.54
Dover	7,216	18,592	26,884	0.27
Durham	2,902	15,852	12,664	0.23
Farmington	3,724	23,640	5,774	0.64
Lee	2,775	12,927	4,145	0.67
Madbury	1,574	7,799	1,509	1.04
Middleton	1,784	11,843	1,440	1.24
Milton	3,457	21,936	3,910	0.88
New Durham	3,116	28,054	2,220	1.40
Rochester	10,105	29,081	28,461	0.36
Rollinsford	1,279	4,843	2,648	0.48
Somersworth	2,755	6,398	11,477	0.24
Strafford	2,503	32,779	3,626	0.69

Note:
1 Developed land areas include four land cover categories (residential/commercial/industrial lands, transportation, disturbed land, and other cleared land) and were developed using the NH Land Cover Assessment (Justice, *et al.* 2002).

Exhibit 4.3-5

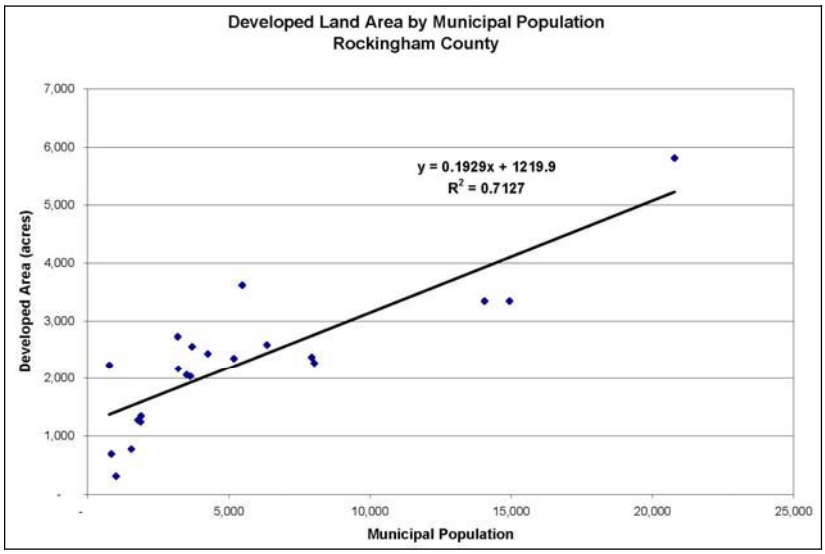

Exhibit 4.3-6

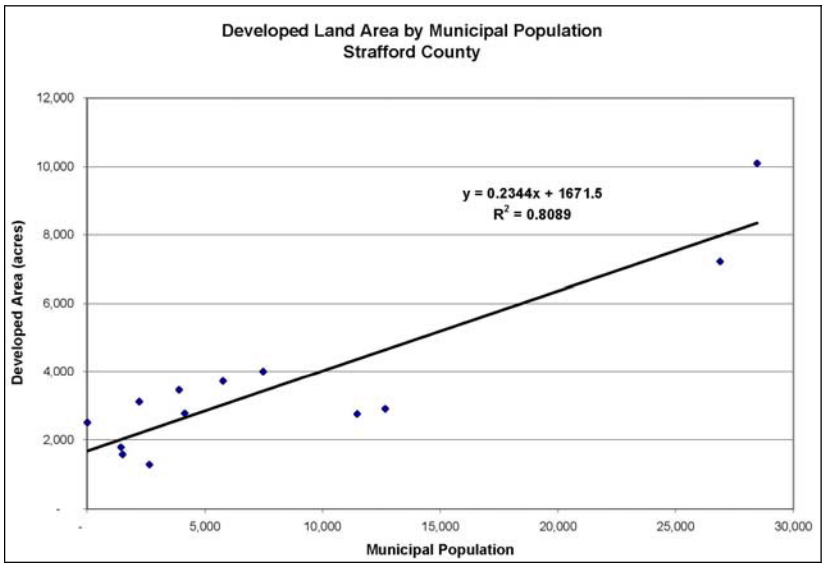

Table 4.3-6
Projected Indirect Land Use, No-Build vs. Eight-Lane Alternatives, 2025

	Population[1]					Additional Developed Land (ac)[2]		
County	2005 (Actual)	2025 No-Build	2025 8-Lane	Growth 2025 No-Build	Growth 2025 8-Lane	No-Build	8-Lane	Difference (Secondary Effect)
Strafford	117,637	139,825	140,976	22,188	23,339	6,872	7,142	270
Rockingham	297,749	368,402	369,116	70,653	71,367	14,849	14,987	138

Notes:
1 Population data are based on REMI model predictions by RKG Associates, as detailed in Table 4.3-3.
2 Developed land projections are based on regression analysis depicted in Exhibits 4.3-5 and 4.3-6, using projected population growth by county.

4.3.5.3 Potential Indirect Impacts on Environmental Resources

The potential land use impacts on environmental resources that could be attributed to secondary growth in the study area are discussed in this subsection. Additionally, brief discussions are presented later in this Chapter for certain environmental resources.

To estimate the amount of resource impacts resulting from secondary growth, it is first necessary to determine the amount of each environmental resource within Rockingham and Strafford counties. By determining the amount of wetlands in Strafford County, for example, it is possible to derive the percentage of wetland (*vs.* upland) per acre. See Table 4.3-7 for these data.

Table 4.3-7
Natural Resources in the Socio-Economic Study Area

County	Total Area	Aquifer[1]		Farmlands[2]		Wetlands[3]		Wildlife Habitat[4]		100-year Floodplain[5]	
	(acres)	(acres)	(percent)	(acre)	(percent)	(acres)	(percent)	(acres)	(percent)	(acres)	(percent)
Rockingham	257,561	12,959	5.0	2,830	1.1	12,079	4.7	30,442	11.8	13,614	5.3
Strafford	244,861	85,022	34.7	11,277	4.6	34,134	4.6	199,464	13.9	48,173	19.7

Notes:
1 Stratified drift deposits, per USGS mapping.
2 Important Farmland Soils, per Natural Resource Conservation Service published soils surveys.
3 National Wetlands Inventory, USFWS.
4 NHF&GD *Coarse Filter Habitat Inventory.*
5 Flood Insurance Rate Map, Federal Emergency Management Agency.

It can be seen from these data that the two counties differ in their environmental characteristics. For example, stratified drift aquifers are substantially more common in Strafford County (34.7 percent of the total land area) than in Rockingham County (only 5.0 percent), due to the differing glacial geology of the two regions. This suggests, if we assume that development occurs in a random spatial pattern, that approximately 0.347 acre of aquifer will be impacted for every acre of development

in Strafford County, while only about 0.05 acre of stratified drift deposits would be impacted in Rockingham County per additional acre of development. Given that the secondary growth land conversion methodology predicts that about 270 acres of additional land will be converted by 2025 in Strafford County, then as much as 94 acres (0.347 x 270 acres) of stratified drift aquifer could be impacted due to secondary growth. The corresponding prediction for Rockingham County would be that only 7 acres of stratified drift aquifer could be impacted, due to the fact that less land conversion is predicted in this region and because the resource is far less common. Table 4.3-8 shows similar estimates for several important environmental resources for Strafford and Rockingham Counties.

Table 4.3-8
Estimated Natural Resource Impacts Potentially Caused by Secondary Growth

	Strafford County[1]		Rockingham County[2]		
Resource	(percent)[3]	(acres)	(percent)[3]	(acres)	Total
Aquifer	34.7	94	5.0	7	101
Farmland Soils	4.6	12	1.1	2	14
Wetlands	13.9	38	4.7	6	44
Wildlife Habitat	81.5	220	11.8	16	236
100-year Floodplain	19.7	53	0.3	1	54

Notes:
1 Assumes 270 acres of secondary land development for Strafford County.
2 Assumed 138 acres of secondary land development for Rockingham County.
3 Data from Table 4.3-7 represents a measure of how common the resource is on the landscape.

A basic assumption of this methodology is that the future land development will occur in a "spatially random" pattern. That is, land development is assumed to occur without regard to the occurrence of environmental resources. This assumption is obviously simplistic, given that communities, the State of New Hampshire and the Federal government all have established policies and regulations to encourage development to avoid sensitive resources. In addition, the method assumes that the current relationship between population and land development remains constant into the future. This assumption may not hold true either, since planning in the region has begun to emphasize "Smart Growth" concepts whereby cluster development, in-fill, and redevelopment is encouraged over the "sprawl" pattern of the past several decades. Nevertheless, the fact that these assumptions are simplistic does not invalidate the approach, but does suggest that the methodology results in a very conservative (worst case) estimate of possible indirect impacts.

For example with regard to wetlands, the above estimate ignores the fact that all wetlands in New Hampshire are protected under State statutes, local ordinances, and as such, are subject to scrutiny and permitting. At the federal level, most wetlands fall under the protection of the Clean Water Act. Records kept by NHDES indicate that in New Hampshire, between 1999 and 2005, the authorized conversion of wetlands statewide (*i.e.,* with approved dredge and fill permits) totaled about 958 acres, or an average of approximately 140 acres per year. During that same

seven-year period, the statewide population grew by approximately 114,000 people.[70] This equates to a wetland impact rate of approximately 0.008 acres/person. Note that this actual rate of impact is roughly one-third of the projected rate derived by the regression methodology (44 acres/1,851 persons = 0.024 acre/person), which supports the conclusion that the estimates are very conservative.

The estimated environmental impacts presented in Table 4.3-8, while not trivial, are minor when considered in light of the total amount of growth and concomitant development pressure that study area will face in the future, particularly when considering more than 20,000 acres of additional land are projected to be developed under the 2025 No-Build condition in the study area communities. The results indicate that communities in the region should prepare for future growth whether the Turnpike improvements are constructed or not. They also suggest that area communities should evaluate their current land use policies. For example, some of these most vulnerable resources (such as wetlands) are protected by regulation, whereas unfragmented habitat, farmland, and aquifers are not necessarily protected.

4.3.5.4 Mitigation

Neither the Council on Environmental Quality (CEQ) regulations nor FHWA's environmental policy or guidance documents implementing NEPA requires mitigation of indirect land use impacts associated with highway improvement projects. Specifically, the CEQ regulations are silent regarding the issue of mitigation for indirect impacts. FHWA policy as governed by 23 CFR 771.105, discusses mitigation in Sections (d)(1) and (d)(2) for adverse impacts that actually result from a project and that the mitigation represents a reasonable public expenditure. The section does not specifically address mitigation for secondary impacts.

In addition, the permitting requirements associated with Section 404(b)(1) Guidelines governing the US Army Corps of Engineers' wetland permit are limited to requiring mitigation for indirect impacts that are quite specific and predictable relative to location and degree. More generalized secondary impacts like those associated with possible future growth in a region do not require mitigation. Instead, such potential impacts are identified, evaluated, and documented in relation to all other impacts so decision-makers have pertinent information on hand to make informed decisions.

4.3.6 Environmental Justice

In accordance with Executive Order 12898 and subsequent procedures developed by the US Department of Transportation, activities that have the potential to generate a disproportionately high and adverse effect on human health or the environment shall

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70 Data from the NH Office of Energy and Planning, http://www.nh.gov/oep/programs/DataCenter/Population/PopulationEstimates.htm

include explicit consideration of their effects on minority and low income populations. In making an assessment of whether or not Environmental Justice (EJ) has been served, information regarding race, color or national origin, and income level should be obtained where relevant, appropriate and practical. Specific consideration should be given to those populations that are most directly served or affected by the proposed action.

Executive Order 12898 does not define the terms "minority" or "low-income." However, guidance provided by CEQ (EPA 1998) describes these terms in the context of EJ analysis. These definitions are unique to EJ analysis and are the basis for the methodology that follows:

- Minority Individual - A minority individual is classified by the US Bureau of Census as belonging to one of the following groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black (not of Hispanic Origin), and Hispanic.
- Minority Populations - According to the CEQ Guidelines, minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
- Low-income Population - Low-income populations are identified where individuals have incomes below the US Department of Health and Human Services poverty guidelines. A low-income population is either a group of low-income individuals who live in proximity to one another or who share common conditions of environmental exposure or effect. However, concentrations of the elderly, children, disabled, and other populations protected by Title VI and related nondiscrimination statutes in a specific area or any low-income group should be discussed if they are described as low-income or minority. The basis for this determination should also be documented.

Although not specifically mentioned in Executive Order 12898, an impact assessment of the elderly, children, and disabled population groups protected under Title VI should also be included in the EJ analysis, since these groups could experience adverse impacts as a result of an action. The elderly population are defined as individuals who are age 65 and over, while people with disabilities have a mobility and/or self-care limitation, as defined by the U. S. Census Bureau.

As part of the Socio-Economic Baseline Conditions Report completed in August 2004[71], the following data were used to identify minority and low-income populations in the study area:

- Population data regarding racial composition from the 2000 US Census;

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71 *Socio-Economic Baseline Conditions Technical Report for the Newington-Dover, Spaulding Turnpike Widening Project*, prepared for the NHDOT by RKG Associates, Inc., August 1, 2004.

- Income data from the 2000 US Census; and
- Graphical representations of Census Block Group (Block Group) boundaries from the 2000 US Census.

This EJ analysis evaluates the characteristics of minority and low-income persons within the project area block groups that have the potential to be disproportionately impacted by the proposed project alternatives. The Baseline Report indicated that approximately 3.8 percent of the project area's population would be classified as minority as compared to 3.2 percent for the regional study area. The Baseline Report included several block groups in the City of Portsmouth that are not within the project area, but are adjacent to it along the Gosling Road corridor. These block groups were included because of the existence of a subsidized housing project (Gosling Meadows) that contains 124 units of housing for low-income families.

Based on a subsequent review completed by the NHDOT, only two block groups (812.2 and 685.3) were defined as being within the area impacted by the project. The minority, elderly, low-income, and disabled populations of these block groups were compared against the populations of the immediately surrounding block groups as part of the EJ evaluation process. This evaluation revealed that the EJ population within the impacted area was meaningfully greater than the surrounding population, as illustrated in Table 4.3-9. One reason for this is the location of the Great Bay School on Woodbury Avenue in Newington, which provides vocational training for disabled individuals and operates a group home on-site that contains 12 single occupancy rooms.

The conclusion of the NHDOT Environment Justice evaluation is that additional outreach efforts should be taken to encourage public comment and participation from the minority and low-income population groups. The minimum accessibility design requirements must be met in accordance with Title II of the Americans with Disabilities Act and it may be necessary to alter the existing pedestrian right-of-way within the scope of the project. It is recommended that Notices of public information meetings will be sent to the Great Bay Residential Facility in Newington, which is the facility where the disabled population is housed.

Table 4.3-9
Environmental Justice Population Analysis[1]

Study Area	Avg. % Elderly Population	Avg % Minority Population	Avg. % Low-Income Population	Avg. % Disabled Population
Impacted Area (BGs 812.2 & 685.3)	13.5%	4.7%[2]	4.3%[2]	25.3%
Surrounding Area[3]	17.6%	2.8%	2.5%	25%

Notes:
1 Data is from NHDOT Inter-Office Communication, dated June 21, 2005
2 The population percentage identified is meaningfully greater than the surrounding area and constitutes an EJ population. Targeted outreach efforts to solicit public participation have been taken due to the characteristics of this particular study area.
3 Defined as all block groups immediately adjacent to the impacted area.

4.3.7 Conclusions and Mitigation

The social and economic analysis indicates that the 3.5 miles of proposed improvements identified for the Spaulding Turnpike would have minimal direct impacts on the communities of Dover and Newington. Property acquisitions for the five build alternatives evaluated range from approximately 4 to 43 acres. In addition, possible reduction in municipal property tax revenues is also extremely small representing less than one percent of total property tax revenues in 2004. Indirect impacts within the project area are also minimal in terms of possible future land use changes, business operations, neighborhood cohesion and environmental resource impacts.

An economic forecasting and policy analysis model was used to evaluate indirect social and economic impacts on 33 communities located in the study area. A No-Build analysis revealed that the present rate of fairly brisk growth (in terms of population, employment and income), experienced by these communities since the 1970s would likely continue, but at a slightly slower rate. However, an evaluation of possible indirect effects due to improvements on the Spaulding Turnpike indicated only a small impact on population and employment growth rates within the Strafford and Rockingham communities included in the study area. Although the rate of population growth in Strafford County communities is slightly higher than Rockingham County communities within the study area, under the Build Alternatives, the differences within the counties are less than two percent of the population growth rate identified under the No-Build analysis. Employment under both alternatives would also increase at a slightly faster rate after project completion in 2015.

As discussed in Section 3.3, a major market related shift has occurred during the last 10 to 15 years between Rockingham and Strafford Counties that has substantially altered the economic and social linkage between the two counties. This change, due to employment growth in Rockingham County and the lower cost of housing in Strafford County, has resulted in an integrated regional economy that is still continuing to evolve. Recent data now indicates that Strafford County, due to a variety of factors, is now attracting more employment producing business activities. This will probably further alter the economic relationship between the two counties.

Although the change in employment and population due to the roadway improvements may seem small, the results of the REMI model indicates that the economic integration of the two counties will likely continue into the future.

A number of factors were identified that could contribute to cumulative impacts. These include continued development at the Pease International Tradeport, business growth in Strafford County such as the expansion of Liberty Mutual in Dover, continued decentralization of retail growth in the region and possible implications of a regional wastewater management study. Finally an examination of Environmental Justice implications indicates that there would be no disproportionate impacts. However, it is recommended that public notices relating to the project will be sent to the Great Bay Residential Facility in Newington.

Although the direct economic effects associated with the Preferred Alternative are relatively small, the impact to landowners will be mitigated. Property requiring acquisition will be appraised utilizing techniques recognized and accepted by the appraising profession and in conformity with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and applicable to New Hampshire State Law. The amount offered for partial acquisitions is the difference between the fair market value of the property before the highway is built and its value after the portion needed for the highway has been acquired and the highway constructed. Completed appraisals are carefully reviewed by an independent appraiser to ensure that requirements of condemnation law and acceptable appraisal methods are met.

The Preferred Alternative currently does not require the full acquisition of any residential properties. Following the Public Hearing, if the Selective Alternative requires residential acquisitions, the displaced residents will be eligible for relocation benefits, which include:

- Fair market value for acquired property
- Relocation advisory assistance services
- Payments for moving and relocation costs
- Replacement housing payments for the home owner
- Residential mortgage interest differential payments and closing costs

Two businesses would be acquired under the Preferred Alternative. The displaced businesses will be eligible for relocation benefits, which include:

- Fair market value for acquired property
- Relocation advisory assistance services
- Payments for actual reasonable moving
- Business re-establishment costs

If identification of affordable housing for any resident displaced by the Selected Alternative prove unfeasible, last resort housing will be made available in accordance with Section 206 of the Uniform Act and governing regulations. As part of the right-of-way acquisition process, particular attention will be given to the current residents of these properties to assure that the needs of the displaced parties are adequately addressed and the project will not knowingly discriminate against low-income and minority residents of the project area.

Figures

New Hampshire DOT
Department of Transportation

Legend:

- SURFACE WATERS
- TOWNLINE
- STATELINE
- STUDY AREA BOUNDARY

PORTSMOUTH
NEWINGTON
DURHAM
ROCKINGHAM COUNTY
STRAFFORD COUNTY
DOVER
NEW HAMPSHIRE
MAINE
PEASE INTERNATIONAL TRADEPORT
PEASE BLVD
GOSLING RD
EXIT 1
EXIT 2
EXIT 3
EXIT 4N
EXIT 4
EXIT 5
EXIT 6
FOX RUN MALL
FOX RUN RD
ARBORETUM DR
RAILWAY BROOK
PEASE SPUR RR
PICKERING BROOK
NIMBLE HILL RD
COLEMAN DR
FLAGSTONE BROOK
TRICKY'S COVE
GENERAL SULLIVAN BRIDGE
LITTLE BAY BRIDGES
LITTLE BAY
HILTON PARK
DOVER POINT RD
HILTON DR
WENTWORTH TER
DOVER POINT
POMEROY COVE
COTE DR
HILTON RD
BOSTON HARBOR RD
SPUR RD
ROYALS COVE
BAYVIEW PARK
CLEARWATER DR
SCAMMELL BRIDGE
BELLAMY RIVER
TOLL PLAZA
HOMESTEAD LN
PINEVIEW LN
PEARSON LN
DOVER POINT RD
SHATTUCK WAY (FORMERLY RIVER RD)
SHATTUCK WAY
BLOODY POINT
UNNAMED PONDS
RIVER RD
WOODBURY AVE
AVERY DR
PATTERSON LN
UNNAMED TRIBUTARY 2
PAUL BROOK
PISCATAQUA DR
UNNAMED TRIBUTARY 1
GUILFORD RR NEWINGTON BRANCH
PISCATAQUA RIVER

EXIT 1	GOSLING ROAD / PEASE BOULEVARD
EXIT 2	FOX RUN ROAD
EXIT 3	WOODBURY AVENUE
EXIT 4	NIMBLE HILL ROAD / SHATTUCK WAY
EXIT 4N	MEDIAN TURNAROUND (DISCONTINUED IN 2005)
EXIT 5	WENTWORTH TERRACE (HILTON PARK)
EXIT 6	US ROUTE 4 / DOVER POINT ROAD

0 750 1500 Feet

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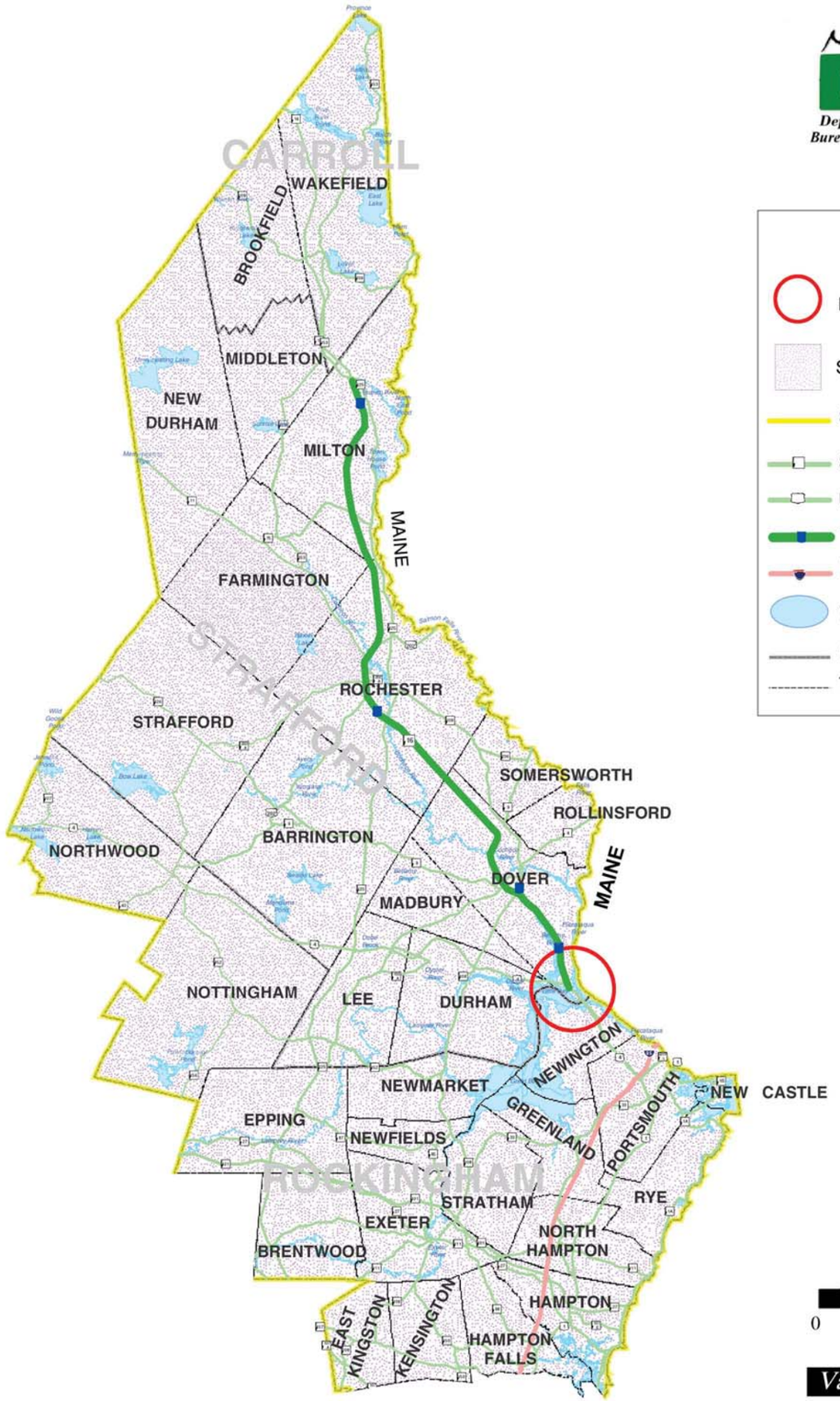
Figure 1.2-2
Project Study Area

Date Created7/12/2006 j:\51425\cad\te\phase3\DEIS\fig010202.dgn



New Hampshire DOT
Department of Transportation
Bureau of Transportation Planning

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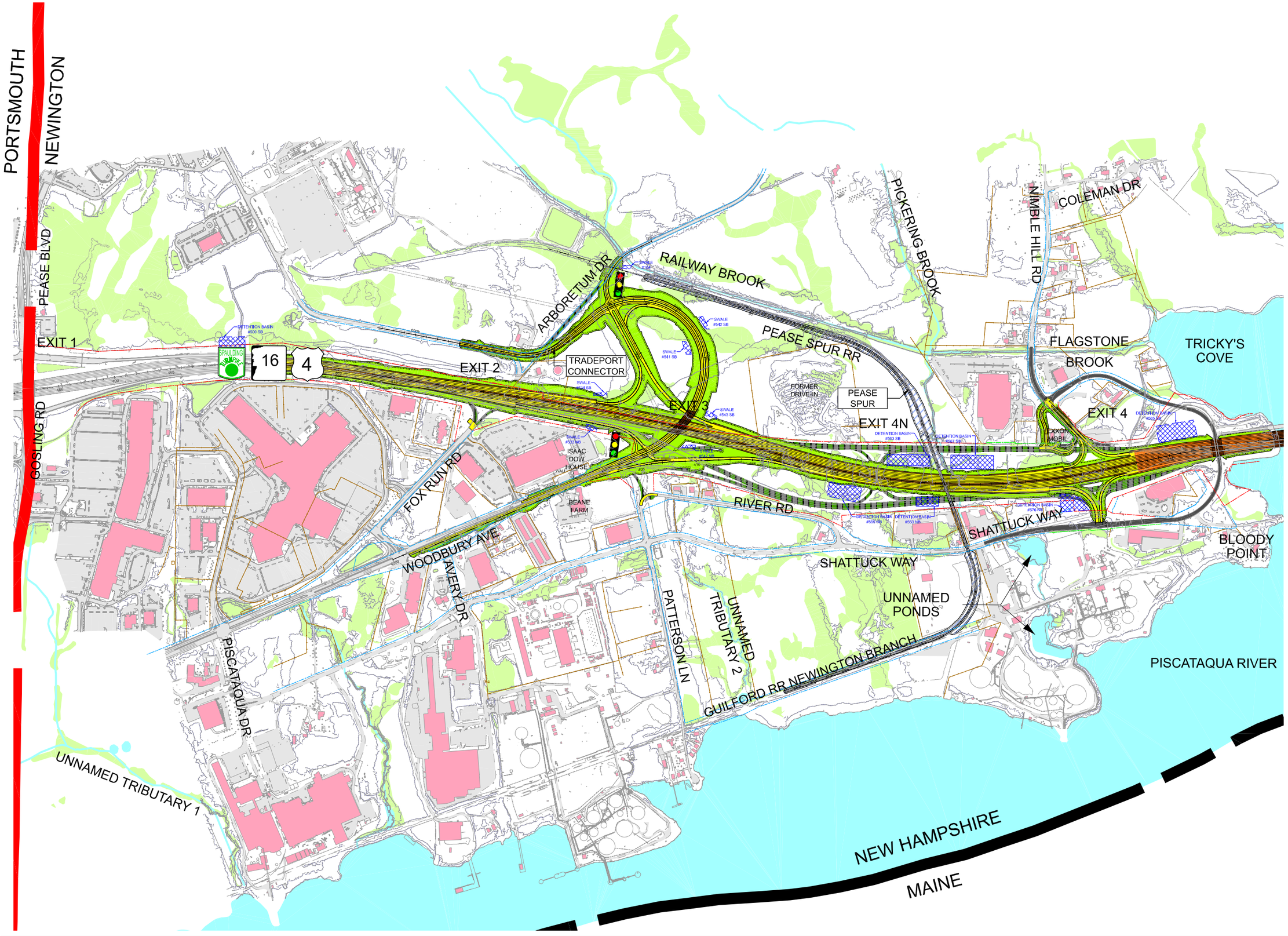
Figure 1.3-1
Socio-economic Study Area



New Hampshire DOT
Department of Transportation

Legend:

- Existing Roadway
- Existing Building
- Existing Wetland
- Existing Property Lines
- Proposed Roadway
- Proposed Bridge
- Proposed Rail Corridor
- Proposed Acquisition
- Pavement Removal
- Existing LAROW
- Existing CAROW
- Existing ROW
- Proposed LAROW
- Proposed CAROW
- Proposed ROW
- Newington Interim Safety Improvements

0 400 800 Feet

Vanasse Hangen Brustlin, Inc.

Figure 2.4-25
Newington Alternative 13

New Hampshire DOT
Department of Transportation

DURHAM
ROCKINGHAM COUNTY
STRAFFORD COUNTY
LITTLE BAY
SCAMMELL BRIDGE
4
ROYALS COVE
BOSTON HARBOR RD
SPUR RD
BAYVIEW PARK
CLEARWATER DR
BELLAMY RIVER
TRICKY'S COVE
HILTON PARK
DOVER POINT RD
ADAPTATIONS
EXIT 6
EXIT 5
POMEROY COVE
COTE DR
HILTON RD
TOLL PLAZA
16
GENERAL SULLIVAN BRIDGE
LITTLE BAY BRIDGES
DOVER POINT
HILTON PARK
HILTON DR
WENTWORTH TER
SHATTUCK WAY (FORMERLY RIVER RD)
BLOODY POINT
NEWINGTON
DOVER
NEW HAMPSHIRE
MAINE
PISCATAQUA RIVER
HOMESTEAD LN
PINEVIEW LN
PEARSON LN
DOVER POINT RD

Legend:

- Existing Roadway
- Existing Building
- Existing Wetland
- Existing Property Lines
- Proposed Roadway
- Proposed Bridge
- Proposed Rail Corridor
- Proposed Acquisition
- Pavement Removal
- Existing LAROW
- Existing CAROW
- Existing ROW
- Proposed LAROW
- Proposed CAROW
- Proposed ROW
- Newington Interim Safety Improvements

N

0 400 800 Feet

Vanasse Hangen Brustlin, Inc.

Figure 2.4-28
Dover Alternative 3

Newington - Dover, NH NHS-027-1(37)/11238

Summary of Roadway and Bridge Impacts (Eight Lanes)

IMPACTS	UNIT OF MEASUREMENT	NO BUILD	ROADWAY SEGMENT NEWINGTON			BRIDGE SEGMENT WIDEN WEST		ROADWAY SEGMENT DOVER	
			ALT 10A	ALT 12A	ALT 13	Remove GSB	Rehab GSB	ALT 2	ALT 3
WATER QUALITY, AQUATIC LIFE, & FISHERIES	Number of Perennial Stream Crossings	0	1	1	1	0	0	0	0
	Length of Perennial Stream Crossings (Feet)	0	420	330	290	0	0	0	0
	Number of Intermittent Stream Crossings	0	0	0	0	0	0	0	0
	Length of Intermittent Stream Crossings (Feet)	0	0	0	0	0	0	0	0
GROUNDWATER QUALITY	Stratified-Drift Aquifer Under New Roadway Area (Acres)	0	4.0	4.0	4.6	1.2	1.6	8.1	8.3
	Number of Well Head Protection Area (WHPA) crossings	0	0	0	0	0	0	0	0
FLOODPLAINS	Floodplain Area Impacted (Acres)	0	0	0	0	0.4	0.4	1.5	0.8
	Floodplain Volume Impacts (Acre-feet)	0	0	0	0	2.7	2.7	1.5	1.2
WETLANDS	TOTAL Wetland Impacted (Acres)	0	13.6	12.8	11.6	1.1	0.9	8.2	7.9
PEM		0	4.7	4.7	3.2	0.2	0.2	2.6	2.5
PFO		0	6.7	6.4	6.8	0.2	0.2	5.4	5.4
POW		0	0	0	0	0	0	0	0
PSS		0	2.2	1.7	1.6	0	0	0.1	0
E1/E2		0	0	0	0	0.6	0.5	0.1	0
THREATENED & ENDANGERED SPECIES	Number of Populations Impacted	0	0	0	0	0	0	0	0
VISUAL	Impacts to Views from and to the Highway (Qualitative)	N/A	Mod	Mod	Low/Mod	Low	Low	Mod	Mod
ARCHAEOLOGICAL	Number of Sensitive Areas Affected (Native American / Historic)	0	9	11	8	5	6	9	8
	Verified Sites and Cemetaries (ac)	0	0	0.03	0	0.2	0.2	0.01	0
	Exhibits Sensitivity (ac)	0	6.6	9.5	5.3	1.8	1.9	12.6	14.4
	Exhibits Probable Sensitivity (ac)	0	23.1	23.9	20.4	3.5	2.8	0.6	0.6
HISTORICAL	Number of Potentially Eligible or Listed Sites Impacted (Adverse Effect)	0	3	3	3	1	1	1	1
RIGHT-OF-WAY DISPLACEMENT	Number of Residential Total Property Acquisitions	0	1	0	0	0	0	0	0
	Number of Business Total Property Acquisitions	0	0	0	0	1	1	1	1
PUBLIC PARKS & RECREATIONAL LAND[1]	Number of Affected Recreational 4(f) Properties	0	0	0	0	1	1	1	1
	Area of Affected Recreational 4(f) Properties (Acres)	0	0	0	0	0.002	0.002	0.4	0.4
PETROLEUM & HAZARDOUS MATERIALS	Number of Potentially Contaminated Properties Impacted	0	19	19	19	0	0	1	1
FARMLANDS	Active Farmlands Impacted (Acres)	0	0	0	0	0	0	0	0
Important Farmland Soils (Acres)	Prime	0	3.8	7.8	2.7	0	0	0	0
	Unique	0	0	0	0	0	0	0	0
	Statewide	0	0	1.5	0	0	0	0	0
	Local	0	0.01	0.01	0.01	0	0	0	0
WILDLIFE HABITAT[2]	High Value Habitat Impacted (Acres)	0	24.9	26.7	20.9	2.3	2.6	3.6	3.7
Riparian Areas	Riparian Impact Areas (Acres)	0	6.8	6.9	4.6	0	0	0	0
Unfragmented Lands (>25 acres)	Impacts to Unfragmented Lands (Acres)	0	12.0	13.1	9.0	0	0	0	0
HYDRODYNAMICS	Change in Tidal Flow Characteristics	0				Minimal	Minimal		
AIR	Microscale CO Exceedances (2025)	0	0	0	0	0	0	0	0
NOISE	Number of Receptors Exceeding FHWA Abatement Criteria	0	1	1	1	0	0	85	85

NOTES:
1 Hilton Park is located in the Bridge Segment of the study area. Bayview Park is located in the Dover portion.
2 High Value Habitat and other wildlife habitat measures are based on mapping by NHF&GD (Coarse Filter Analysis).

Preferred Alternative

Figure 2.5-1
Summary of Environmental Impacts

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Newington - Dover , NH 11238

Summary of Costs for the Newington - Dover 8-lane Alternatives

COST FACTORS AND TRANSPORTATION DATA		ROADWAY SEGMENT NEWINGTON			BRIDGE SEGMENT		ROADWAY SEGMENT DOVER		COMBINED SEGMENT COMPARISON RANGE		
					WIDEN LITTLE BAY BRIDGE (LBB) TO THE WEST & REHABILITATE GENERAL SULLIVAN BRIDGE (GSB) FOR USE AS MULTI-USE PATH	WIDEN LITTLE BAY BRIDGE (LBB)TO THE WEST, INCLUDE MULTI-USE PATH AND REMOVE GENERAL SULLIVAN BRIDGE (GSB)			MINIMUM ROADWAY LENGTH / NUMBER OF BRIDGES	MAXIMUM ROADWAY LENGTH / NUMBER OF BRIDGES	
		ALT 10A	ALT 12A	ALT 13	LBB w /GSB	LBB w/o GSB	ALT 2	ALT 3	(ALT 13, LBB w/o GSB, ALT 2)	(ALT 12A, LBB w/ GSB, ALT 3)	
TRANSPORTATION DATA	LENGTH OF FREEWAY (LANE MILES)	10.6	10.6	10.6	5.0	5	7.6	7.6	**23.2**	**23.2**	LANE MILES
	LENGTH OF RAMPS (LANE MILES)	2.3	2.1	2.5	0	0	2.5	2.4	**5.0**	**4.5**	LANE MILES
	LENGTH OF LOCAL ROADWAYS (LANE MILES)	6.2	6.6	5.0	1.1	1.1	4.1	4.6	**10.2**	**12.3**	LANE MILES
	TOTAL LENGTH OF IMPROVEMENTS (LANE MILES)	**19.1**	**19.3**	**18.1**	**6.1**	**6.1**	**14.2**	**14.6**	**38.4**	**40.0**	LANE MILES
	NUMBER OF BRIDGES	**3**	**7**	**1**	**1**	**1**	**1**	**2**	**3**	**10**	EACH
COST FACTORS	**ALL COSTS ARE IN MILLIONS OF DOLLARS (FY 2005)**								**LOWEST COMBINED SEGMENT COST (ALT 13, LBB w/o GSB, ALT 2)**	**HIGHEST COMBINED SEGMENT COST (ALT 12A, LBB w/ GSB, ALT 3)**	**$**
ROADWAY COST	ALL ROADWAY COSTS ASSOCIATED w/ FREEWAY, RAMPS & LOCAL ROADS	33.6	35.8	31.3	11.2	11.2	30.5	30.6	**73.0**	**77.6**	MILLIONS
RAIL ACCOMMODATION COST (1)	ALL ROADWAY AND BRIDGE COSTS ASSOCIATED WITH ACCOMMODATING PEASE SPUR	1.1	1.9	0.1					0.1	1.9	MILLIONS
	TOTAL ROADWAY COST	**34.7**	**37.7**	**31.4**	**11.2**	**11.2**	**30.5**	**30.6**	**73.1**	**79.5**	MILLIONS
BRIDGE COST	COST FOR ALL BRIDGES (EXCEPT LITTLE BAY, GENERAL SULLIVAN, AND PEASE SPUR)	11.7	14.7	8.4	1.8	1.8	6.1	8.9	16.3	25.4	MILLIONS
	WIDEN LITTLE BAY BRIDGE TO EIGHT LANES				55.5	63.8			63.8	55.5	MILLIONS
	REHABILITATE GENERAL SULLIVAN BRIDGE FOR PEDESTRIAN / BICYCLE USE				23.0				0.0	23.0	MILLIONS
	REMOVE GENERAL SULLIVAN BRIDGE					5.0			5.0	0.0	MILLIONS
	TOTAL BRIDGE COST	**11.7**	**14.7**	**8.4**	**80.3**	**70.6**	**6.1**	**8.9**	**85.1**	**103.9**	MILLIONS
ROADWAY AND BRIDGE COST TOTAL		**46.4**	**52.4**	**39.8**	**91.5**	**81.8**	**36.6**	**39.5**	**158.2**	**183.4**	MILLIONS
PRELIMINARY ENGINEERING	COST ASSOCIATED WITH DESIGN ENGINEERING, GEOTECHNICAL EVALUATION	**3.7**	**4.2**	**3.2**	**7.3**	**6.5**	**2.9**	**3.2**	**12.6**	**14.7**	MILLIONS
RIGHT OF WAY COSTS (2)	ESTIMATED COST FOR RIGHT OF WAY ACQUISITIONS	**2.1**	**2.2**	**1.0**	**0.0**	**0.0**	**1.1**	**1.2**	**2.1**	**3.4**	MILLIONS
TOTAL SEGMENT COST		**52.2**	**58.8**	**44.0**	**98.8**	**88.3**	**40.6**	**43.9**	**172.9**	**201.5**	MILLIONS
BUS COSTS (3)	COMBINATION OF THREE BUS ALTERNATIVES AND ENHANCED TRANSFER POINT	**5.0**							**5.0**	**5.0**	MILLIONS
RAIL COSTS (4)	RANGE OF RECOMMENDED NEAR TERM AND FUTURE RAIL SERVICE	**1.7 TO 13.5**							**1.7** #	**1.7** #	MILLIONS
PARK AND RIDE COSTS (5)	COMBINATION OF TWO PARK AND RIDE LOTS IN ROCHESTER AND DOVER	**3.6**							**3.6**	**3.6**	MILLIONS
MITIGATION AND ENHANCEMENT COSTS	WETLAND CREATION, RESTORATION, PRESERVATION. (INCLUDING RIGHT OF WAY AND CONST COST)	**6.0**							**6.0**	**6.0**	MILLIONS MILLIONS
RANGE OF TOTAL COSTS									**189.2**	**217.4**	MILLIONS

THE COLOR SHOWN IN THE SEGMENT COLUMNS ABOVE IDENTIFIES THE DEPARTMENT'S **PREFERRED ALTERNATIVE.**

(1) THE **RAIL ACCOMMODATION COST** FOR NEWINGTON ALTERNATIVES 10A, 12A AND 13 ARE FOR ONLY THOSE NECESSARY ROADWAY ELEMENTS (BRIDGE, EXCAVATION AND DRAINAGE COSTS) THAT NEED TO BE CONSTRUCTED AS PART OF THESE ALTERNATIVES TO ALLOW FOR THE OPERATION OF THE PEASE SPUR, IF REACTIVATED. FOR ALTERNATIVE 13, THE COST TO ACCOMMODATE THE SPUR IS THE COST ASSOCIATED WITH THE MEDIAN PIER SUBSTRUCTURE ONLY ($0.1 MILLION), NO OTHER ROADWAY ELEMENTS NEED TO BE CONSTRUCTED AS PART OF ALTERNATIVE 13 TO ACCOMMODATE THE RR SPUR. IF THE SPUR IS REACTIVATED, THE RAIL CAN BE ELEVATED (OVERPASS) WITHOUT SIGNIFICANTLY IMPACTING THE OPERATION OF THE TURNPIKE (ESTIMATED COST IS $4.4 MILLION).

(2) ESTIMATED COST FOR RIGHT OF WAY ACQUISITIONS (BASED UPON 2004 MUNICIPAL ASSESSMENT RECORDS AND AVERAGE LAND VALUES IN NEWINGTON AND DOVER.) DOES NOT INCLUDE APPRAISAL OR OTHER ADMINISTRATIVE COSTS

(3) COSTS ASSOCIATED WITH IMPROVING BUS SERVICE IN SEACOAST AREA INCLUDE A COMBINATION OF ALTERNATIVES: BUS ALTERNATIVE 1 @ $0.4 MILLION; BUS ALTERNATIVE 2 @ $0.4 MILLION; BUS ALTERNATIVE 3 @ $4.1 MILLION. IN ADDITION, THE COST ASSOCIATED WITH AN ENHANCEMENT OF THE EXISTING BUS TRANSFER POINT AT THE FOX RUN MALL IS $110,000.

(4) COSTS ASSOCIATED WITH IMPROVING RAIL SERVICE INCLUDE A RANGE OF ALTERNATIVES: FOR NEAR TERM, ALTERNATIVE 1C IS RECOMMENDED WHICH EXPANDS THE EXISTING *DOWNEASTER* SERVICE ($1.7 MILLION); ALTERNATIVES 1A &1B INVOLVE FUTURE EXPANSION OF SERVICE INTO DOVER AND ROCHESTER (RANGE OF FUTURE COSTS ARE $11.3 TO $11.8 MILLION)

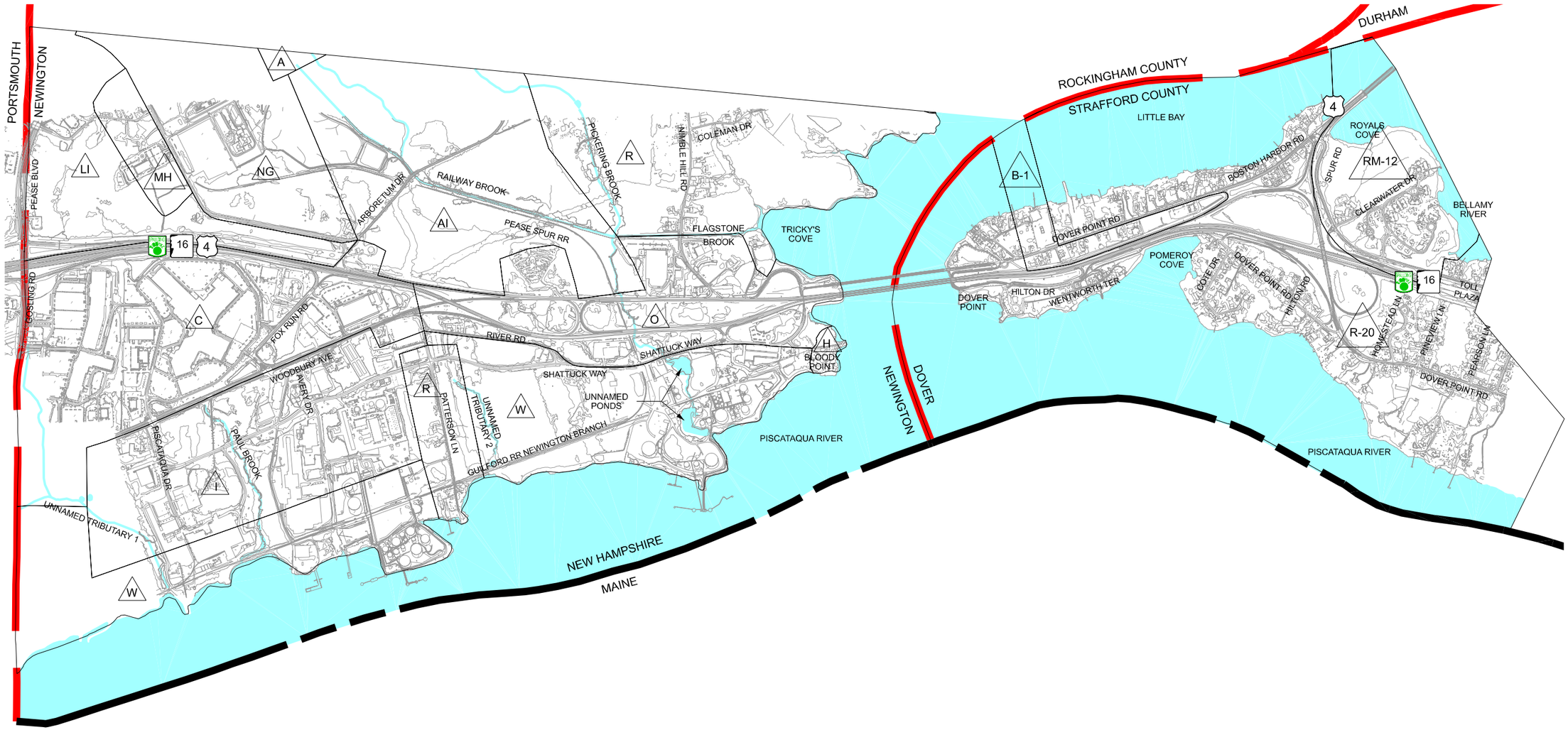
(5) THE COSTS ASSOCIATED WITH THE CONSTRUCTION OF A PARK AND RIDE LOT IN DOVER ARE $2.55 MILLION. THE COSTS FOR THE PARK AND RIDE LOT IN ROCHESTER RANGES FROM $1.0 TO $1.1 MILLION DEPENDING UPON WHICH SITE IS SELECTED.

PREFERRED ALTERNATIVE COST (MILLIONS)	
NEWINGTON SEGMENT (ALT 13)	44.0
BRIDGE SEGMENT (LBB w/GSB)	98.8
DOVER SEGMENT (ALT 3)	43.9
BUS SERVICE	5.0
RAIL SERVICE	1.7
PARK AND RIDE LOTS	3.6
MITIGATION	6.0
TOTAL	203.0

w/ NEAR TERM RAIL COST ALTERNATIVE 1 C

SUMMARY OF COSTS 8-LANE ALTERNATIVES
FIGURE 2.6-2

New Hampshire DOT
Department of Transportation



Legend:

- SURFACE WATERS
- TOWNLINE
- STATELINE

NEWINGTON ZONING

- R — RESIDENTIAL DISTRICT
- C — COMMERCIAL DISTRICT
- AI — AIRPORT INDUSTRIAL DISTRICT
- I — INDUSTRIAL DISTRICT
- MH — MOBILE HOME DISTRICT
- H — HISTORIC DISTRICT
- W — WATERFRONT INDUSTRIAL DISTRICT
- A — AIRPORT DISTRICT
- O — OFFICE DISTRICT
- LI — LIGHT INDUSTRIAL
- NG — NEW HAMPSHIRE NATIONAL GUARD (NOT LOCALLY ZONED)

DOVER ZONING

- B-1 — NEIGHBORHOOD BUSINESS DISTRICT
- RM-12 — LOW-DENSITY MULTIRESIDENTIAL DISTRICT
- R-20 — LOW-DENSITY RESIDENTIAL DISTRICT

N

0 750 1500 Feet

Vanasse Hangen Brustlin, Inc.

Figure 3.3-1
Zoning Districts,
Newington and Dover

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